

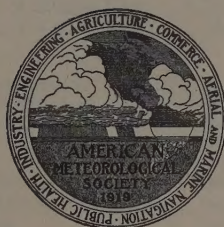
METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 8

JUNE, 1957

No. 6



SPECIAL FEATURE IN THIS ISSUE

Annotated Bibliography on Numerical Forecasting
(Supplement, 1954-1957)

Compiled by
Geza Thuronyi

(For complete table of contents see back cover)

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FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to bring to the attention of meteorologists current literature in their field and in related fields and to provide bibliographic information on various subjects, as interest demands.

Part I contains abstracts of current literature in the fields of meteorology, oceanography, etc., arranged according to the Universal Decimal Classification.

Part II of each issue comprises an annotated bibliography of important references on a special subject (usually arranged chronologically). No attempt is made to prepare exhaustive bibliographies; instead, the aim is to include a representative cross section of the various aspects of a subject.

Bibliographies published in the successive issues were:

Vol. I, 1950

- | | | | |
|---------------------|-------------------------|--------------------|------------------|
| 1. Atmos. Pollution | 2. Aerobiology | 3. Cloud Physics | 4. Hail |
| 5. Tornadoes | 6. Volcanic Dust | 7. Climat. Changes | 8. Thunderstorms |
| 9. Icing | 10. Acoust. Propagation | 11. Evaporation | |

Vol. II, 1951

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|------------------------|--------------------------|-------------------|------------------------|
| 1. Extended Forecast. | 2. Long Range Forecast. | 3. Soil Temp. | 4. Constants, etc. |
| 5. Clim. of Near East | 6. Clim. of Middle East | 7. Special Winds | 8. Radar Storm Detect. |
| 9. Condensation Trails | 10. Clim. of N.E. Africa | 11. Mountain Met. | |

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- | | | | |
|-------------------------|----------------------|-----------------------------|-----------------------|
| 1. Clim. of N.W. Africa | 2. Carbon Dioxide | 3. Clim. of Argentina, etc. | 4. Dew |
| 5. Objective Forecast. | 6. Stratus Forecast. | 7. Urban Climatology | 8. Clim. of C. Africa |
| 9. Visibility | 10. Glaze and Rime | 11. Free Air Turbulence | |

Vol. IV, 1953

- | | | | |
|----------------------|--------------------------|---------------|----------------------------|
| 1. Turbulence Theory | 2. Turbulent Diffusion | 3. Frost | 4. Clim. of Australia, etc |
| 5. High Level Winds | 6. Winds in Stratosphere | 7. Jet Stream | 8. Radiation Bioclim. |
| 9. Clim. of Pacific | 10. Auroras | 11. Sferics | |

Vol. V, 1954

- | | | | |
|--------------------|------------------------|--------------------------|--------------------|
| 1. Oceanog. Met. | 2. Clim. of S.E. Asia | 3. Auroral Physics | 4. Tropopause |
| 5. Balloons | 6. Numerical Forecast. | 7. Radiation Data | 8. Vertical Motion |
| 9. Clim. of Arctic | 10. Industrial Met. | 11. Wind Waves and Swell | |

Vol. VI, 1955

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| 1. Bibliog. of Bibliog. | 2. Texts & Monogr. Bibliogs. | 3. Storm Surges |
| 4. Ionospheric Prop. | 5. Photochem.—Upper Atmos. | 6. Cloud Physics |
| 7. Radar Cloud Physics | 8. Atmos. Nuclei (1841–1950) | 9. Atmos. Nuclei (1951–1955) |
| 10. Weather Modification | 11. Cooling Power | |

Vol. VII, 1956

- | | | |
|--------------------------|-----------------------------|------------------------|
| 1. Synoptic Met.-Arctic | 2. Clim. of Enclosed Spaces | 3. Cosmic Rays (–1952) |
| 4. Cosmic Rays (1953–56) | 5. Atmos. Radioactivity | 6. Inversions |
| 7. Snow Micromet. | 8. Snow Micromet. (Suppl.) | 9. Tropical Cyclones |
| 10. Hurricane Damage | 11. Tropical Cyclone Theory | |

Vol. VIII, 1957

- | | |
|------------------------------------|------------------------------------|
| 1. Solar Relations with Weather | 4. Forest Micrometeorology |
| 2. Night Airglow | 5. Hydrometeorological Forecasting |
| 3. Forecasting of Special Elements | 6. Numerical Forecasting |

Other bibliographies in preparation are:

Actinometers

Albedo

Human Bioclimatology

Microwave Propagation

Ozone

Radio Astronomy

Singularities

Synoptic Aerology

Part III contains a listing of reviews, translations, reprints, and the contents of important publications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. The December issue comprises cumulative author, subject, geographical and journal indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DSG:	U. S. Army Medical Library, Washington, D. C.
DSI:	Smithsonian Institution Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.
MH-BH:	Harvard University, Blue Hill Observatory Library, Milton, Mass.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts

Geographic locations are in the English form rather than the form used locally, for example Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146-151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, Jahrgang 2 (Vol. 2), Heft 5/6 (No. 5/6), pages 146-151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

MAJOR GENERAL WORKS

COLLECTED WORKS

See also: Reports on investigations of shelter belt effects, 8.6-260; Studies in weather analysis and forecasting (Petterssen), 8F-96.

8.6-1

550.3:061.3(08)

American Geophysical Union, Antarctica in the International Geophysical Year, based on a Symposium on the Antarctic, co-sponsored by the U. S. National Committee for the IGY of the National Academy of Sciences, National Science Foundation and American Geophysical Union. Its *Geophysical Monograph*, No. 1, 1956. 133 p. figs., tables, bibliogs. Map of the Antarctic folded in pocket. *National Academy of Sciences—National Research Council, Publication*, No. 462. Review by Frank T. Davies in *Science*, Wash., D. C., 124(3235): 1297, Dec. 28, 1956. **DLC**—This volume contains the various papers presented at the Antarctic Symposium sponsored by the American Geophysical Union on April 26-27, 1956. Pertinent articles are abstracted separately. (For listing of contents, see Pt. III, p. 1445, Nov. 1956, *MAB*.) *Subject Headings*: 1. Antarctic symposia 2. International Geophysical Year, 1957-1958. I. U. S. National Committee for the IGY II. National Science Foundation III. National Research Council.—*I.L.D.*

8.6-2

551.513.2:551.557(08)

Freeman, John C., Jr. et al., Barotropic models of the planetary jet stream. Texas Agricultural and Mechanical College. Dept. of Oceanography and Meteorology, Contract AF 19(604)-559, Scientific Report No. 12, Sept. 1956. 98 p. 42 figs., 19 refs., numerous eqs. **DWB**—Several papers are presented in this report, covering theoretical studies of barotropic models of the jet stream, considering vorticity, blocking and other problems of numerical prediction. The papers are: 1. Freeman, J. C., The constant vorticity model of the planetary jet stream. 2. Freeman, J. C., The three vorticity models of the planetary jet stream with continuous velocity. 3. Hurt, John T., Formulation of the planetary jet stream problem for n bands of constant vorticity on a sphere. 4. Kasahara, Akira and Freeman, J. C., Three bands of constant vorticity on a sphere. 5. Freeman, John C., Numerical prediction in Starr's quasi-Lagrangian coordinates. The studies are mainly theoretical but a number of isotach charts, cross sections and synoptic vorticity charts for actual cases are appended along with schematic models and drawings. *Subject Headings*: 1. Jet stream models 2. Barotropic models of jet stream 3. Numerical prediction 4. Blocking 5. Vorticity calculation.—*M.R.*

8.6-3

551.5:908(98)

Leningrad. Arkticheskii Nauchno-Issledovatel'skii Institut, O novykh sovetskikh issledovaniyakh i otkrytiyakh v Tsentral'noi Arktike. [New Soviet investigations and discoveries in the Central Arctic.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr.* No. 5:3-16, Sept./Oct. 1954. 14 figs. (incl. photos and fold. charts). **DLC**. Also translation by E. R. Hope, New Soviet researches, explorations and discoveries in the Central Arctic. Also Hope, E. R., A new picture of magnetic disturbance in the high latitudes (translator's comments on fig. 14 of preceding item). Both latter items issued as *Canada. Defence Research Board, T 165 R*, Dec. 1954. 39 p. 146 figs. (incl. photos), 22 refs. **DWB**—As a result of the post-war exploratory work—carried out rather uniformly over an enormous area (5 million sq. km) by various "mobile research groups" provided with aircraft and light portable equip-

ment and permanent research bases on drifting ice fields—the stations North Pole II, III and IV were established in April 1950 and 1954. Many former ideas of natural conditions in the Central Arctic have been changed and new discoveries have been made. The most important are: 1) discovery and exploration of the great 2500–3000 m high underwater mountain range extending from the New Siberian Islands to the North Pole and beyond it in the direction of Greenland and Ellesmere Island, and of the bottom of the Arctic Basin; 2) new information on the ice cover and its movement and direction; 3) new information on the variability of aerological conditions and on the radiation balance; and 4) discovery of a singular magnetic anomaly and new laws of magnetic perturbations in the high latitudes showing that this magnetic anomaly is intimately connected with the Siberian maximum of the vertical field. Many graphs, charts and photos are included. *Subject Headings:* 1. Arctic investigations 2. Magnetic disturbances 3. Arctic sea ice 4. Arctic bottom topography 5. Arctic. I. Hope, E. R. (trans.).—A.M.P.

8.6-4

551.5:378.4(08)

†Sociedad Geográfica do Lima, *Jornadas de Meteorología*, Dic. 1950. [Seminars on meteorology, Dec. 1950.] pub. Lima, 1951. 293 p. figs., tables, refs., bibliogs. Contents: Gamio, Enrique M., *Historia de la meteorología peruana* [History of Peruvian meteorology], p. 32–55; Roldán Seminario, Ernesto, *El Servicio Meteorológico Nacional* [National Meteorological Service], p. 56–64; Wagner, Carlos A., *El observador meteorológico* [The meteorological observer], p. 65–78; Galecio M., Benjamín, *Funcionamiento eléctrico de los equipos de radio sonda* [Electrical functioning of radiosonde equipment], p. 79–81; Dextre Freyle, Bartolomé, *Aplicación del radio sonda en la meteorología* [Application of the radiosonde in meteorology], p. 82–85; Amat y Leon, Eduardo, *Problemas de irrigación y su relación con la meteorología* [Irrigation problems and their relation to meteorology], p. 86–113; Wagner, Guillermo, *Método moderno de sondajes aerológicos en Inglaterra* [Modern methods of aerological sounding in England], p. 114–119; Dellepiane O., Carlos, *Aplicación del radar a la meteorología aeronáutica* [Application of radar to aeronautical meteorology], p. 120–127; Martin Lynch, Alberto, *Aplicación de la meteorología a la mejora de la técnica del riego* [Application of meteorology to the improvement of irrigation technique], p. 128–137; Garcia Méndez, Carlos, *La carta del tiempo y su aplicación al pronóstico meteorológico en el Perú* [The weather chart and its use in meteorological forecasting in Peru], p. 138–146; Delgado Bedoya, Gabriel, *Meteorología y medicina* [Meteorology and medicine], p. 147–162; Casaverde, Mateo, *Manchas solares y fenómenos meteorológicos: precipitación en Huancayo* [Sun spots and meteorological phenomena: precipitation in Huancayo], p. 163–169; Giesecke, Alberto A., *Microsismos y meteorología* [Microseisms and meteorology], p. 170–176; Mostajo, Benjamín, *Observaciones psicométricas* [Psychometric observations], p. 177–182; Indacochea G., Angel J., *Precipitaciones hidrometeoricas como agente modelador andino* [Hydrometeoric precipitation as an Andine influence], p. 183–186; Meneses, Carlos, *La vinculación entre los pronósticos del tiempo y las operaciones aéreo comerciales* [Connection between weather forecasting and commercial air operations], p. 187–191; Hurtado, Alberto, *Meteorología y biología de altitud* [Upper air meteorology and biology], p. 192–194; Olazo Olivera, Luis, *Como divulgar la ciencia meteorológica entre el estudiantado y el pueblo* [Diffusion of meteorological science among the student body and among the populace], p. 198–206; Spann, H. J. and Petersen, U., *Algunas observaciones instrumentales en los glaciares de los Andes Peruanos* [Some instrument observations in the glaciers of the Peruvian Andes], p. 209–225; Indacochea Gárate, Angel J., *Las precipitaciones en el campo de la geología dinámica* [Precipitation in the field of dynamic geology], p. 226–248; *Lista de libros y trabajos presentados a las primeras Jornadas de Meteorología del Perú* [List of books and works presented at the first Seminar in Meteorology of Peru], p. 249–250; [translation into Spanish of] Anderson, Charles E., *Evaluation of results of Joint Air Force-Weather Bureau Cloud seeding trials conducted during winter and spring, 1949*, p. 262–293. **DLC**—Seminars on the oceanography and geography of Peru held in Lima in 1946 and 1949. These first meteorological seminars were planned by ERNESTO ROLDÁN SEMINARIO in Aug.–Sept. 1950 to consist of lectures to be given on 16 days from Dec. 1 to 28 at 1800 h on every aspect of Peruvian meteorology (history, climate, service, upper air soundings, agrometeorology, cloud seedings, etc.). The numerous

documents relating to the seminars and the papers themselves, plus some bibliographic material (e.g., on rainmaking from U. S. W. B. and on glaciology of Peru) are included in this volume. Some of the illustrations are not clear, but excellent folded color charts are included. *Subject Headings:* 1. Meteorological seminars 2. Meteorology of Peru 3. Peru.—M.R.

8.6-5

551.513.2:551.557(08)

§Texas. Agricultural and Mechanical College. Dept. of Oceanography and Meteorology, Analysis and forecasting of wind field near the tropopause. Contract AF 19(604)-559, Final Report, Sept. 1956. figs., tables, refs., eqs. Contents: Scientific Reports, p. 9-11. Abstracts and summarizing remarks on specific scientific studies of the Project, p. 12-28. Jet stream studies not previously printed: Saucier, W. J., Project Jet Stream B-47 Flights, 2, 6, 9, 11, and 14, p. 30-78. 10 figs., tables, 5 refs. Saucier, W. J., Notes of the kinematic and hydrostatic geometry of jet streams, p. 79-88. 7 eqs. [Staff Members], Investigations of temperature and wind speed in the middle and upper troposphere, p. 89-94. Gilcrest, Robert A., Study of wind speed and temperature at 500 mb over selected aerological stations in the U. S. in winter, p. 96-103. table, 7 figs. Baer, Ledolph, Brief study of temperature and wind speed in the jet stream, p. 104-111. 4 figs., 5 refs. DWB—A thorough review of personnel, publications and a presentation of a number of unpublished reports connected with a project which continued from 1953-6, for the study of the winds, turbulence and jet stream structure near the tropopause on the basis of B-47 flights (Project Black Sheep), and coordinated with Project Jet Stream. Abstracts of 12 scientific reports and 11 scientific papers published under this project are included. The studies whose titles are listed above contain elaborate graphical (and synoptic) analyses of winds, temperatures and structure of jet streams for particular cases where data over the eastern U. S. was especially detailed. *Subject Headings:* 1. Jet stream structure 2. Tropopause wind field 3. Project Black Sheep. I. Saucier, W. J.—M.R.

8.6-6

551.579.4:551.577:551.506(54,593)

*United Nations. Economic Commission for Asia and the Far East, Proceedings of the Regional Technical Conference on Flood Control in Asia and the Far East. Its *Flood Control Series*, No. 3, Pub. Bangkok, 1952. 320 p. 75 figs., tables, foot-refs. DWB—Included are the following papers: Pramanik, S. K., Floods and rainfall, p. 164-166. Handa, C. L. and Sehgal, S. R., Review of the recent floods, 1950, in Punjab, India, with suggestions for short term and long term measures, p. 214-219. Lal, Harbans, Flood problems of Patiala and their solutions, p. 228-239. Kambhu, Momlaung Xujati, Characteristics of floods and preventions of damages in Thailand, p. 240-243. Analysis of rainfall data during floods carried out by the India Meteorological Department for the Damodar, Kayna and Mahandi catchments is reviewed in the first article (p. 164-166); for Punjab in the second article (p. 214-219); for Patiala (a tributary of the Ghaggar River (p. 228-239) in India and for Thailand (p. 240-243). *Subject Headings:* 1. Flood—rainfall data analysis 2. India 3. Thailand.—M.R.

TEXTBOOKS AND POPULAR SCIENCE BOOKS

8.6-7

551.46(02)

†Dietrich, Günter and Kalle, Kurt, *Allgemeine Meereskunde: eine Einführung in die Ozeanographie*. [General science of the sea: an introduction to oceanography.] Berlin, Gebrüder Borntraeger, 1957. 492 p. 223 figs., 30 plates, 7 charts (fold. in pocket), 63 tables, bibliog. p. 458-471, eqs. DWB. Review by F. Model in *Deutsche Hydrographische Zeitschrift*, 9(6):299-306, 1956. fig., foot-refs. DWB—An unusually attractive and timely textbook on general physical, chemical, geological and regional oceanography, ranking with the three previous top works in this field (i.e., SVERDRUP, JOHNSON and FLEMING, 1942; SHULEIKIN, 1953; and PROUDMAN, 1953). This does not count the many excellent works on marine meteorology or hydrography. The 10 main chapters are concerned with: 1. Geomorphology of the sea bottom; 2. Physical and chemical properties of sea water; 3. Oceanographic instruments and methods of observation; 4. Heat economy of the oceans; 5. Temperature, salinity, density and ice distribution in seas; 6. Chemistry of oceans; 7. Theory of currents; 8. Surface and internal waves; 9. Long waves and tidal waves; and 10. Regional oceanography. Excellent

reference lists for each chapter are included in the bibliography. *Subject Headings:* 1. Oceanography textbooks 2. Physical oceanography 3. Chemical oceanography.—M.R.

8.6-8

551.578.7(73)

§*Flora, Snowden Dwight, **Hailstorms of the United States**. Norman, Univ. of Oklahoma Press, 1956. 201 p. 12 figs., numerous photos., 6 tables, numerous foot-refs. **DLC**—As in the case of his book on **Tornadoes in the U. S.** (see 4.8-8 and 6.3-2), FLORA has taken a subject which is of immense importance in his home state of Kansas, and like a true scientist has examined every conceivable facet of the subject and come up with a readable, yet informative and authoritative, book giving the meteorological, geographical, agricultural and economic facts and statistics for the benefit of the meteorologist or layman, student or farmer, teacher or insurance actuary. The 7 chapters are entitled: 1. Hail: the white plague; 2. Oddities of hail and hail damage; 3. When and why hailstorms occur; 4. Forecasting hail; 5. Insurance against hail damage; 6. Hail hazard by States; 7. Hailstorms in other countries. Tables show diurnal, seasonal and regional frequencies, damage and insurance data. Several maps of the U. S. show hail statistics by states or portions of states in a number of ways: hailstorm, hail damage, hail days, ratio of hail days to thunderstorm days, hail insurance rates, etc. A state by state summary of hailstorms and damage, including listing of the most costly occurrences and dates thereof, unusual types and occurrences of hail, increase of hail occurrence with altitude, etc. are included. The region of greatest hail occurrence is just east of the Continental Divide from Denver north into Wyoming and Montana. Greatest damage, of course, occurs farther east where crop values are higher. Incidentally, North Carolina is the only state east of the Mississippi where annual damage runs into the millions of dollars (largely due to vulnerability of tobacco plants). *Subject Headings:* 1. Hailstorms in the U. S. 2. Hail damage statistics 3. Popular science books 4. United States.—M.R.

8.6-9

551.5(02)

Grunow, Johannes, **Allgemeine Wetterkunde**. [General meteorology.] 2nd ed. Berlin, Gartenverlag, 1955. 148 p. 34 figs., 16 photos., 70 refs. **DLC**—The 8 chapters of this small textbook on general aspects of meteorology deal with: 1. The atmosphere, 2. Heat economy of the atmosphere, 3. Clouds and precipitation, 4. Weather phenomena (föhn, air masses, fronts, convective action), 5. Atmospheric cycle (circulation between hemispheres within hemispheres and in cyclones, etc.), 6. Weather rhythms (land-sea, mountain-valley, monsoons, atmospheric waves), 7. Forecasting (short, long and local frost), and observation, 8. Signs and popular rules for forecasting (human sensitivity, pressure, plant-animal signs, farmers and singularity rules, lunar influence). Clever schematic diagrams and useful illustrative and appended material are included. *Subject Heading:* 1. General meteorology textbooks.—M.R.

8.6-10

551.501.4:551.506.1(02)

*Leningrad. Glavnaia Geofizicheskaiia Observatoriia, **Rukovodstvo po podgotovke meteorologicheskikh ezhegodnikov**. [Handbook for preparation of meteorological yearbooks.] Leningrad, Gidromet. Izdat., 1955. 220 p. 51 figs. (some fold.), 155 tables. **DLC**—The separate chapters cover: 1. general information (station location tables and charts, description of stations, etc.); 2. technical control of the tabular material; 3. critical examination of the meteorological elements in the annual tables, specifically those on pressure, temperature, humidity, cloudiness, wind, precipitation, snow cover, atmospheric phenomena, soil temperature, sunshine duration and precipitation from automatic pluviographs; and 4. contents of yearbooks. This exceedingly detailed handbook gives instructions for preparation of all phases or sections of the annual meteorological summaries for the entire Soviet Union, with numerous examples, sample forms, etc. The methods of control are illustrated by statistical and graphical analyses that make use of correlation of elements between each other in time and space to show up errors. *Subject Headings:* 1. Manual for compilation of yearbooks 2. Climatological summaries 3. Annual meteorological summaries 4. U.S.S.R.—M.R.

8.6-11

523.7(02):016

†Unsöld, Albrecht (*Kiel Univ.*), *Physik der Sternatmosphären*. [Physics of stellar atmospheres.] 2d ed. Berlin, Springer, 1955. 866 p. 257 figs., 106 tables, refs. by chapter, p. 793-848. Price: 168 DM. Review by T. G. Cowling in *Journal of Atmospheric and Terrestrial Physics*, London, 9(4):236, Oct. 1956. (First ed. 1937). **DLC**—In this extremely detailed technical summary of every aspect of astrophysics brought up to date by inclusion of new findings between 1937 and 1955, sections are devoted to: 1) thermal or radiative balance of stellar atmospheres, 2) continuous spectra and structure of a stellar atmosphere, 3) intensity distribution of spectral lines, 4) physical theory of spectral lines, 5) origin of spectral lines, 6) physics of the sun, and 7) radio-frequency and cosmic radiation from quiet and disturbed sun and from space. A bibliography (by chapters) of >1700 references and a subject index are appended. *Subject Headings*: 1. Astrophysics textbooks 2. Stellar atmospheres 3. Radio astronomy 4. Cosmic radiation 5. Bibliography on solar physics.—*M.R.*

8.6-12

551.510.5:551.507.362

Vaeth, Joseph Gordon, 200 miles up; the conquest of the upper air. 2d ed., rev. print. New York, Ronald Press Co., 1956. 261 p. 77 figs. (incl. photos). Review by J. J. Kelly in *American Meteorological Society, Bulletin*, 38(5):307-308, May 1957. For abstract on first ed. see 3.8-31, Aug. 1952, *MAB*. **DLC**—The first edition (1951) of this book contained chapters on upper atmosphere research, properties, instruments, rockets, constant level balloons, the White Sands Proving Ground, V-2, WAC Corporal, aerobee and Viking rockets. These have not been changed much in the 2nd edition except for inserting a little data obtained since 1951 on rocket biological experiments, high altitude rocket or balloon flights. Three additional chapters, however, give the latest findings or plans for high level airplane, guided aircraft, skyhook balloon, satellite, 3-stage rocket, manual balloon and space ship exploration for astronomical, astrophysical, aerial photography, meteorological, cosmic ray and other studies outside the earth's atmosphere. About 20 new illustrations, all of them excellent, are included in the new edition. Since 1951 the airplane has reached 85,000 ft (comp. 59,000 ft.), and 158 mi (in 1954) for a single stage rocket (Viking II) compared with 114 mi previous to 1951. Photographs were taken up to 155 mi. Another new project (called FATSO—First Airborne Telescopic and Spectrographic Observatory) is aimed at high level spectrophotographic and telescopic observations of the planets and moon from manned balloons. It should give excellent data on planetary atmospheres, especially water vapor content which cannot be determined because of water vapor in earth's atmosphere. *Subject Headings*: 1. Upper atmosphere research 2. Rocket instrumentation 3. Rocket soundings 4. Skyhook balloons 5. FATSO (First Airborne Telescope and Spectrographic Observatory) 6. Satellite observatories 7. White Sands Aerological Unit 8. White Sands, New Mex.—*M.R.*

8.6-13

551.5:595.7(02)

Ross, Herbert Holdsworth (*Ill. Univ.*), *Textbook of entomology*. 2d ed. N. Y., John Wiley, 1956. 519 p. 402 figs., bibliog. at end of each chap. Ch. 9, **Ecological considerations**, p. 425-466. **DLC**—In this modern textbook on entomology, p. 426-438 of the section on **Environmental factors** takes up the most important weather factors. Light, temperature, frosts, humidity, precipitation, snow, hail and wind, are discussed and examples of data presentations or correlations provided to show effect of these factors on insect development, mortality, activity or disease. Bees can control temperature and air condition hives. Temperature is a critical factor in all insect life—not the average temperature, but day to day temperature or temperature and humidity determine living responses of each separate species of insect or stage in the growth of one species. Seasonal coordination with plant growth or stage is also conditioned by weather and is a critical factor in the insect-host relationship. Local or microclimatic differences are also important and often critical. Soil and plant temperature and moisture is to be taken into account. Weather also may determine spread and geographical limits of a species. *Subject Headings*: 1. Weather and insects 2. Entomology textbooks.—*M.R.*

MONOGRAPHS AND OUTSTANDING PAPERS

See also: International Geophysical Year, 8.6-30; Preparatory expedition to Greenland, 1948, 8.6-40; Adélie Land-Greenland, 1947-1950, 8.6-41; Sea temp. variations, N. Iceland coast (Stefánsson), 8.6-72; Sea surface temp., N. Iceland coast (Stefánsson), 8.6-73; Design temp. for space heating, 8.6-97; Radiosonde comparisons (Malet), 8.6-144; Advection vector of perturbations (Gião), 8.6-195; Solar radiation, Stanleyville (Schüepp), 8.6-219; Shelter belt cultivation, 8.6-260; Inversion effects on convection (Vehrencamp et al.), 8.6-271; Icing data measured on scheduled airline flights (Perkins), 8.6-283; Dye tracer technique . . . (von Glahn et al.), 8.6-303; Hydrologic cycle, 8.6-315; Dynamic climatology (Gião, Ferreira), 8.6-343.

8.6-14

551.577.38(78)

†Weaver, John Ernest and Albertson, F. W., *Grasslands of the Great Plains: their nature and use*. Lincoln, Nebraska, Johnsen Pub. Co., 1956. 395 p. 91 figs. (incl. photos), bibliog. p. 379-387. Ch. 6, *Changes in vegetation in drought*, p. 86-100. DLC—Soil and climate (as it relates to grasslands of the Great Plains) are discussed briefly on p. 11-15. The general climatic conditions during the Great Drought of the 1930's are discussed on p. 77-79, and its effects on vegetation and crops on p. 79-85. Soil moisture, precipitation, etc. during the drought (1933-39) are analyzed on p. 86-89, and dust storms, annual progress of drought, etc. are discussed on p. 86-100. The corresponding conditions in the 10 good years (1942-52) are treated on p. 152-68 and the return of drought (1952-5) on p. 160-162. Drought in Montana is mentioned on p. 333-336. *Subject Headings*: 1. Drought, Great Plains (1933-39) 2. Dust storms 3. Ecology 4. Great Plains, U. S.—M.R.

8.6-15

551.586:612

†*Weight, Ernst, *Europäer in Ostafrika: Klimabedingungen und Wirtschaftsgrundlagen*. [Europeans in East Africa: climatic conditions and economic foundation.] Cologne, Geographisches Institut der Universität Köln, 1955. 385 p. 37 maps, 25 photos, 50 tables, about 350 refs. English summary, p. 360-361. *Kölner Geographische Arbeiten*, Vol. 6/7, 1955. DLC. Review in *Geographical Journal*, London, 122(3):384-385, Sept. 1956. DLC—This study of European settlement in the equatorial tropics of Africa and the agricultural activity of Europeans includes an analysis of the climate and the acclimatization of the European to the climate. The qualitative description of radiation is followed by a quantitative account of air temperature including temperature extremes, annual variation and spatial distribution, and daily variations of precipitation including the temporal distribution of precipitation and its dependence upon air movements, influence of relief upon precipitation, duration of rain and drought periods, rainfall maxima and spatial distribution of rainfall, interannual variation of rainfall and rainfall intensity, influence of altitude upon climatic phenomena with reference to the influence of climate upon man. The author considers sultriness, cooling power, radiation and uniformity of weather, effect of climate upon health and acclimatization. *Subject Heading*: 1. Acclimatization.—I.L.D.

8.6-16

551.509(02) 551.5(02)

§Great Britain. Meteorological Office, *Weather map; an introduction to weather forecasting*. 4th ed. London, H.M.S.O., 1956. 105 p. 37 figs., 6 tables. At head of t-p. M.O. 595. DWB—The 3rd edition was published in 1939 so that a number of revisions were necessary. Chapters are: Historical; Observations—pressure and wind; Relation of wind to pressure; Observations—temperature and weather; Preparing the weather map; Weather associated with pressure systems—depressions; Weather associated with pressure systems—anticyclones and subsidiary systems; Forecasting from weather maps; Prebaratics and the use of upper air information; The forecasting service and some forecasts (including forecasts on television). The book is well illustrated with synoptic charts. *Subject Heading*: 1. Forecasters manuals.—C.E.P.B.

8.6-17

551.582.2(51)

*Lu, Wu, *Chung kuo ch'i hou tsung lun*. [Climate of China.] Shanghai, Cheng Chung Shu Chü, 1947. 295 p. 8 figs., 181 tables. In Chinese. DLC—A good treatise on the

climate of china. Ch. 1. Climate of China and the geographical environment; 2. General circulation of the atmosphere; 3. Monsoons and frontal activities; 4. Atmospheric disturbances; 5. Air temperature; 6. Humidity, fog, haze, cloudiness and sunshine; 7. Rainfall; 8. Climatic change and long range forecasting; and 9. Climatic provinces of China. *Subject Headings:* 1. Climate of China 2. General circulation 3. Climatic data 4. Long range forecasting 5. China.—*H. Arakawa.*

8.6-18

551.5:6

*Terada, Kazuhiko, **Kisho Saigai**. [Damage from weather phenomena.] Tokyo, Asakura Shoten, July 30, 1956. 262 p. 111 figs., 45 tables, bibliog. p. 255-257. In Japanese. **DWB**—A book of interest to specialists or students of marine, agricultural or industrial meteorology, with 50 chapters under 12 headings. The elements of meteorology and climatology and handling of records by means of punched cards, graphical techniques, synoptic and dynamic meteorology, etc. are covered in detail. Damage to ships at sea from tropical and extra-tropical storms, flood and wind damage; rain, drought, hot and cold wave, hail and lightning damage; snow and ice damage, surf or tidal wave damage, etc. are treated. Many synoptic charts, graphs, cross sections, histograms, schematic diagrams, tables and other visual presentations break up the monotony of the Japanese text. A chronology of typhoons from 636 to 954 is found on p. 10-17. *Subject Headings:* 1. Weather damage 2. Japanese language textbooks.—*M.R.*

8.6-19

551.579.4(74)

Dempsey, David, **Flood**. N. Y., Ballantine Books, 1956. 138 p. map, photos. **DWB**, **DLC**—A dramatic human-interest type of report on the great disaster which occurred in Connecticut, N.E. Pennsylvania and adjacent areas of bordering states on Aug. 18-19, 1955. A total of 382 communities had been devastated by the flood waters and hundreds of thousands of people made homeless or dependent on relief. The cause of the floods (hurricane rains following less than a week after the ground was soaked by hurricane rains from "Connie," and lack of flood control structures), warnings issued or not issued, suddenness of the onset of the floods, human suffering, reconstruction efforts and long-range consequences, both favorable and unfavorable, are plainly depicted by a reporter who visited every community involved and compiled information from a score of agencies, including the U. S. Weather Bureau. *Subject Headings:* 1. Floods, N.E. United States (Aug. 19, 1955) 2. Disaster accounts 3. Connecticut 4. Pennsylvania.—*M.R.*

8.6-20

551.588.7(04)

Heyer, Ernst, **Das Klima und seine Beeinflussung durch den Menschen**. [Climate and its modification by man.] Leipzig, Urania-Verlag, 1955. 36 p. 7 figs., 9 refs. *Gesellschaft zur Verbreitung Wissenschaftlicher Kenntnisse, Vortragsreihe Naturwissenschaftler*, Vol. 37. **DLC**—A popular pamphlet going into general aspects of the definition of climate, climatic classifications, climatic changes and artificial modification of climate or microclimate by means of cities, smoke and gases, shelter belts, irrigation projects, artificial lakes or seas, etc. *Subject Headings:* 1. Climate control 2. Climatic changes 3. Popular meteorology.—*M.R.*

8.6-21

551.552(569.4) 551.557.2(569.4)

*Israel. Meteorological Service, **Climatological normals**, Pt. 2, **Winds**. *Israel. Meteorological Service, Series A, Meteorological Notes*, No. 15, 1956. 7+77 p. mainly tables. In English and Hebrew. **DLC**—Per mille frequencies of surface wind forces and directions at 8, 14 and 20 h (G.M.T.+2) are given for each month for 21 stations, with weighted means of Beaufort force and annual totals. Extremes are quoted for 4 anemometer stations, the highest gust being 141 km/hr at Tel Aviv shore. Per mille frequencies of upper winds at Lod airport, 1938-46, from pilot-balloons, are given for each month at 200, 500, 1000, 2000 and 3000 m a.s.l. Mean vector speed and direction, mean speed and steadiness are tabulated. *Subject Headings:* 1. Wind distribution 2. Upper air winds 3. Israel.—*C.E.P.B.*

8.6-22

551.543:525.6:91.04(99)

†Hisdal, V.; Amble, O. and Schumacher, N. J., **Pressure [from] Norwegian-British-Swedish Antarctic Expedition, 1949-1952.** (In its: *Scientific Results*, Vol. 1, Pt. 2A, pub. Oslo, Norsk Polarinstitut, 1956. 64 p. 40 figs., 31 tables, 43 refs.) DWB—In Pt. 1, the instruments used for measuring pressure on the Maudheim expedition, their installation and calibration, etc. are described. In Pt. 2, the pressure data for Maudheim, 71°03'S, 10°56'W for every 3 hours from Feb. 22, 1950 to Jan. 13, 1952 (except 03^h) are analyzed statistically in a dozen different ways: frequencies by months and 5 mb pressure intervals; mean and seasonal variations; smoothed annual curves; serial correlations; mean daily range; mean monthly range; and 3- and 24-hourly tendencies and standard deviations. Fourier analysis of tidal oscillations, both in the atmosphere and the ocean (the station is on floating ice) constitutes the basis of the last half (Pt. 3) of this excellent monograph. The diurnal and semidiurnal components of atmospheric pressure variations are shown graphically and their seasonal variations indicated. In spite of the small number of observations, which makes the results somewhat irregular and not too significant, a seasonal variation can be noted. The marine tides are shown to be of secondary importance. Use of these methods for determining marine tides at Weather Ships is suggested. *Subject Headings:* 1. Atmospheric pressure in Antarctica 2. Atmospheric tides 3. Maudheim Expedition, 1949-1952 4. Marine tidal effects on pressure readings 5. Maudheim, Antarctica. I. Norwegian-British-Swedish Antarctic Expedition, 1949-1952.—M.R.

8.6-23

551.582(987)

†Arens, John J. (comp.), **Canadian North.** Prepared for the Technical Assistant to Chief of Naval Operations for Polar Projects by Georgetown University under the direction of Paul R. Sullivan. Issued by the Technical Assistant, April 1956. 446 p. charts, numerous photos, bibliog. p. 425-446. DWB—A voluminous descriptive coverage of the many individual river basins of Yukon Territory, Mackenzie, Keewatin, Baffin Island; Arctic British Columbia, Alberta, Saskatchewan and Manitoba; Hudson Bay; Arctic Ontario and Quebec; Labrador and the North Coast. A chapter is included on the geology of northern Canada. Appended are good bibliographies on each of the above areas, plus a series of hardly legible maps of each region, with place names, rivers, etc. entered thereon. The bulk of the information is geographical or historical. The section on Hudson Bay (p. 235), however, contains details of seasonal ice conditions, precipitation, clouds, winds, fogs, air and water temperature circulation of waters and a list of weather reporting stations and their coordinates. A map of the whole area shows mean snow cover at end of each month (Oct. 31-April 30). A short section or paragraph on climate is included in each major division. *Subject Headings:* 1. Canadian Arctic geography 2. Climate of Canadian Arctic 3. Canadian Arctic. I. Sullivan, Paul R. II. Georgetown University.—M.R.

8.6-24

551.510.42:628.53

†Bryant, L. W. and Cowdrey, C. F. (National Physical Lab.), **Effects of velocity and temperature of discharge on the shape of smoke plumes from a funnel or chimney: experiments in a wind tunnel.** *Institution of Mechanical Engineers, London, Proceedings*, 169(23):371-400. 1955. 34 figs. (incl. photos), 10 tables, numerous foot-refs., 19 eqs. DWB—Results of elaborate measurements of temperature, wind and SO₂ concentration made during wind tunnel tests with various models and ambient conditions are analyzed and more detailed data given in the numerous comments and discussion which follow the original paper. These tests were begun in 1948 and the paper completed in 1953, but not presented until the London meeting on Feb. 11, 1955. Results are given for both hot and cold plumes. It was found that cold plumes, resulting from washing the effluent to remove some of the SO₂, actually show an increased maximum of SO₂ concentration near the stack in all conditions except those of high wind speeds. All manner of quantitative data are given in tables and graphs for varying turbulence, wind and temperature conditions, as well as stack height and distance factors. Discussion by W. F. CAREY, gives data on concentration of isobars in an airborne plume axial and ground level dilutions of gas released at heights of 100, 200, 400, 600, 800 and 100 ft at distances downwind from 200-12,800 ft with a wind of 20 ft/sec and average turbulence

terminal rise of a plume at various temperatures and gas rates, and difference between washed and unwashed gases on ground concentrations. C. H. BOSANQUET, D. H. LUCAS, P. A. SHEPARD, W. RAILSTON, R. S. SCORER, G. NONHEBEL, J. W. BATEY, B. WOOD and T. R. CAVE—BROWNE-CAVE give substantial contributions in comments, and the authors present more detailed data on concentrations, velocity transverse of plumes, and temperature traverse of plumes, in reply to CAVE. *Subject Headings:* 1. Smoke plume meteorology 2. Stack effluents.—M.R.

8.6-25

532.72:551.511

*Holland, D. J., *Micrometeorological diffusion formulae: a quantitative assessment of their relative merits in the light of available data.* Porton, England. *Chemical Defence Experimental Establishment, Porton Technical Paper*, No. 329, March 26, 1953. 24 p. 19 figs., 3 tables, 14 refs. DWB—SUTTON's, CALDER's and DEACON's formulas for determining diffusion or resulting concentration of a gas downwind from a line or point source are tested against each other mathematically, and against empirical data collected near the ground in open country during the past 30 years at Porton, Eng., and elsewhere. A slide rule was made from SUTTON's formula derived 15 years ago. This is found to be as accurate as other formulas, although some refinements could be made to cover nonadiabatic conditions. This formula is accurate within a factor of 2 for 80% of occasions with adiabatic and 40% of nonadiabatic lapse rates. Numerous nomograms show cloud width and peak concentration under various conditions, and at various heights and ranges. *Subject Headings:* 1. Diffusion formulas 2. Point source diffusion 3. Sutton's diffusion slide rule 4. Aerosol concentration.—M.R.

8.6-26

551.594.14

*List, Robert J. (U. S. W. B., Wash., D. C.), *Radioactive fallout in North America from Operation Teapot.* U. S. Atomic Energy Commission, [Report] NYO-4606 (Del.), Feb. 1956. 28 p. 19 figs., 4 tables, 92 figs. in appendix. (For abstract on pre-publication issue, see E-210, May 1956, MAB)—Operation Teapot, in the spring of 1955, consisted of 14 atomic detonations at the Nevada Test Site. Meteorological trajectories were computed for the resulting radioactive debris and related to the fallout observed by the gummed film network of 87 stations in the continental U. S., twelve stations in Canada, and six stations elsewhere in North America. Maps showing daily fallout data for the period Feb. 18-May 20, 1955 are appended. A series of special gummed film observations near Chicago indicated that on dry days with significant fallout, film exposed in vertical and inverted positions averaged about 40% of the activity on a regular horizontal film. On days with precipitation, the values were 4% on vertical films and 1% on the inverted films. A radioautograph of individual raindrops during a period when rainout was occurring indicated that three drops in a hundred were radioactive. The radioactive drops contained both particulate and dissolved radioactivity. *Subject Headings:* 1. Radioactive fallout data 2. United States.—Author's abstract.

8.6-27

551.510.42:551.557.2

Neiburger, Morris; Renzetti, Nicholas A. and Tice, Rita, *Wind trajectory studies of the movement of polluted air in the Los Angeles basin.* Air Pollution Foundation, Los Angeles, Report, No. 13, 2(1), April 1956. 74 p. 21 figs., 10 tables, 11 refs. DWB, DLC—Aerometric surveys were made in 1954 and almost 1000 trajectories computed for numerous instances when pollution was noted, in order to determine the source of pollutants. Less than 6% of the trajectories showed air coming from the San Bernardino Valley, and 25% was air which had previously been over the basin. Only a small percentage (5%) of polluted air had been within a reasonable distance of industrial areas which gave off such gases. Most of the pollution came from automobile exhaust. Report gives details of analyses and data for different pollutants and trajectories, and trajectories are shown on charts. *Subject Headings:* 1. Atmospheric pollution trajectory studies 2. Los Angeles Basin, Calif.—M.R.

8.6-28

551.594.7:016

*Plank, Vernon G., *A meteorological study of radar angels.* U. S. Air Force. Cambridge Research Center, *Geophysical Research Papers*, No. 52, July 1956. 117 p. 29 figs., 4 tables,

113 refs., 24 eqs. **DWB, DLC**—Three different types of angels are recognized: 1) layer angels, 2) localized source angels, and 3) erratic angels. Their nature, size, meteorological conditions favoring each type, other sources (insects and birds or dust), refractive index inhomogeneities, the history of angels of each type, and a thorough bibliography are presented in this monograph. A tremendous amount of theoretical, graphical and tabular data are analyzed and incorporated in the text. Work is based on radar soundings at Round Hill, Mass. in 1951-53 and on work of others in this field. Of all the possible sources, refractive index inhomogeneities are found to be the most common. Activity is the greatest with high temperature, moisture content and light winds, and with pronounced convective activity. *Subject Headings:* 1. Refractive index inhomogeneities 2. Angels 3. Radar angels 4. Angel bibliographies.—*M.R.*

8.6-29

551.511:551.510.528

†Staley, Dean O., *Evaluation of the physical processes occurring at and near the tropopause* Wash. (State) Univ. Dept. of Meteorology and Climatology, Contract AF 19(604)-314 Occasional Report, No. 5; Scientific Report, No. 2, Sept. 1956. 84 p. 26 figs., 3 tables, 99 refs., 39 eqs. **DWB**—The major physical processes at and near the tropopause are evaluated. These processes are radiation, convection and turbulence, advection and vertical convergence. Radiation acts to smooth the temperature profile. Convection is infrequent and unimportant in establishing the tropopause. Turbulence will act to smooth the temperature profile unless flux has certain relationships to hydrostatic stability. Advection and vertical convergence cannot be universal mechanisms of tropopause formation. Nonconservative forces and diabatic temperature change are found to occur during a specific case of tropopause formation. It is suggested that turbulent enthalpy flux is divergent for positive curvature of the temperature profile and thereby creates a tropopause by increasing curvature of the temperature profile. Turbulent enthalpy flux is reformulated to verify that the flux can be divergent for positive curvature of the temperature profile. *Subject Heading:* 1. Tropopause physics.—*Author's abstract.*

MANUALS

See: Handbook for preparation of met. yearbooks, 8.6-10; Forecasters manual, 8.6-16.

GENERAL GEOPHYSICS AND METEOROLOGY

IGY, WMO, UNESCO

See also: Antarctica in the IGY, 8.6-1; Trans-Antarctic Expedition, 1955-58 (Fuchs), 8.6-45; Trans-Antarctic Expedition, 1955-58 (Fuchs), 8.6-46; Internatl. ice nomenclature (Nusser), 8.6-60; Auroral obs. in IGY, 8.6-110; IGY aurora program (Barlow), 8.6-366.

8.6-30

550.3:061.3(73)

National Academy of Sciences, *International Geophysical Year: a special report prepared for the Committee on Appropriations of the U. S. Senate. U. S. 84th Congress. Senate, 2d session. Committee on Appropriations, Document No. 124, 1956. 27 p. 3 maps (2 fold).* **DLC**—Pamphlet outlines U. S. program as it fits into the entire IGY program, and the special projects [meteorology, oceanography, glaciology, upper atmosphere, solar activity, ionospheric physics, aurora and airglow, geomagnetism, cosmic rays, earth's crust and core, seismology, gravity, latitude and longitude, rockets and satellites, orbits and tracking of satellites (shown on chart), air density, meteors, UV radiation, U. S. program and Antarctic program (station shown on chart)] as of this pamphlet. Forty-six nations are actively participating. A list of members of the various U. S. committees is given. *Subject Headings:* 1. U. S. participation in IGY 2. U. S. IGY committees.—*M.R.*

8.6-31

551.510.535:550.3:061.3

Dieminger, W., *Das Internationale Geophysikalische Jahr, III, Die Pläne der Ionosphärenforschung.* [The I.G.Y., Pt. 3, The plan of ionosphere investigation.] *Umschau*, 57(5):132-

134, March 1, 1957. 2 figs. **DLC**—More than 200 stations are planned to investigate ionosphere during IGY, forming a wide network along geomagnetic equator, strips on 70°W, 10°E and 150°E, and special networks in auroral zones in Canada and Antarctica. German program is described. *Subject Headings: 1. Ionosphere research 2. International Geophysical Year program.*—*C.E.P.B.*

8.6-32

550.3:061.3:551.46

Bohnecke, G., *Das Internationale Geophysikalische Jahr, II: Die ozeanographischen Arbeiten und der deutsche Anteil.* [The International Geophysical Year, Pt. 2, Oceanographical work and the German participation.] *Umschau*, 57(3):65-67, Feb. 1, 1957. 5 figs. **DLC**—German cooperation is not sought in the first 4 points of oceanographical research, but the 5th, the "Polar Front" survey, is a German proposal aimed at recognizing changes in heat and food economy of the North Atlantic. The effect of the Gulf Stream on temperature is shown by a map and sections. The planned investigations of the "Gauss" and "Anton Dohrn" are sketched and also those of 10 nations using about 20 ships. As ocean research ships are costly, it is hoped that they will also be used for marine biology. *Subject Headings: 1. International Geophysical Year oceanography program 2. German participation in IGY.*—*C.E.P.B.*

8.6-33

551.46:550.3:061.3

Deacon, G. E. R., *Oceanography in the International Geophysical Year.* *Marine Observer*, 27(175):33-36, Jan. 1957. **DWB**—Plans to study sea-level changes of long and short period and surface and deep-water movements in the oceans are described. Present knowledge of secular and seasonal variations and of propagation of long waves or surges is surveyed. *Subject Heading: 1. International Geophysical Year oceanography program.*—*C.E.P.B.*

8.6-34

550.3:061.3

Faust, Heinrich, *Vom Geophysikalischen Jahr.* [On the Geophysical Year.] *Naturwissenschaftliche Rundschau*, 10(2):60-62, Feb. 1957. **DWB**—The greatest interest is in the artificial satellite. Also described are the program of investigation of oceanic "polar fronts," atmospheric circulation and transformations of energy in the atmosphere, glaciology and ionosphere observations. *Subject Heading: 1. International Geophysical Year program.*—*C.E.P.B.*

8.6-35

550.3:061.3

Jones, Sir Harold Spencer, *The International Geophysical Year.* *Institute of Navigation, London, Journal*, 10(1):17-30, Jan. 1957. **DWB**—History of IGY is set out. Programs are explained in meteorology, geomagnetism, auroras, airglow, cosmic rays, ionosphere, glaciers, oceanic circulation, longitudes and latitudes. Rockets and "rockoons," and the proposals to launch artificial satellites, are described. *Subject Heading: 1. International Geophysical Year, 1957-1958.*—*C.E.P.B.*

8.6-36

550.3:061.3

Sans Huelin, Guillermo, *Ciclo de conferencias relativas al Año Geofísico Internacional 1957-1958.* [Cycle of conferences on the 1957/1958 International Geophysical Year.] *Revista de Geofísica*, Madrid, 14(56):395-409, Oct./Dec. 1955. **DWB, DLC**—The 2 previous Polar Years are discussed (13 countries took part in first International Polar Year, and 26 took part in second). Already 36 countries had agreed to participate in the IGY 1957/58 program. Five conferences on IGY matters were held in Spain during 1955 to decide on the part to be played by Spain in seismic, meteorological, ionospheric, magnetic, geodetic, rocket and solar activity programs of IGY. These matters are discussed in some detail. *Subject Headings: 1. International Geophysical Year program 2. Spanish participation in IGY.*—*M.R.*

8.6-37

551.5:550.3:061.3

Sutton, Sir Graham, *The Meteorological Office and the International Geophysical Year.* *Marine Observer*, 27(175):19-20, Jan. 1957. Also: Shellard, H. C., *The International Geo-*

physical Year. *Ibid.*, p. 20-27. 2 figs., 3 refs. **DLC**—**SUTTON** describes the aims of the IGY, "the greatest co-operative effort of science yet attempted," and the need to make the survey of atmospheric circulation from the sun's rays to the winds complete. **SHELLARD** describes history of IGY, meteorological programs with charts of actual and proposed stations (world and Antarctic), and notes on other observations. *Subject Heading*: 1. International Geophysical Year program.—*C.E.P.B.*

8.6-38

551.5(213)

Rubiato, J. M., Humid tropics research. *World Meteorological Organization, WMO Bulletin*, 4(4):149-152, Oct. 1955. photo. **DWB**—Work of WMO in collaboration with the UNESCO program for Humid Tropics which parallel that of the Arid Zone Research Committee is outlined, and conditions within the humid tropics are described. A panel of experts on humid tropics, to promote within WMO activities on scientific and technical problems concerning the humid tropics, consists of **E. BERNARD** (Belgian Congo), **S. N. NAQVI** (Pakistan), **J. R. CLACKSON** (Brit. West Africa) and **A. B. SERRA** (Brazil). Some of the problems to be solved are listed. *Subject Headings*: 1. Humid tropics research 2. Tropical meteorology.—*M.R.*

8.6-39

551.585.9(661)

Humid tropics research. *Journal of Scientific and Industrial Research, Sec. A*, New Delhi, 15(9):410-411, Sept. 1955. **DWB, DLC**. Summarized from *UNESCO Features*, No. 192:7, 1956.—Notes on needs and plans for humid tropics research. The humid tropics constitute $\frac{1}{4}$ of the usable land on earth. The role of the meteorologist and climatologist is emphasized. The first meeting of the Advisory Committee on Humid Tropics Research will be held in early 1957 at the Institute for Tropical Study and Research at Abidjan, French West Africa. A panel of 120 experts from 23 countries has been drawn up by UNESCO. *Subject Heading*: 1. Humid tropics research 2. UNESCO. Advisory Comm. on Humid Tropics Research.—*M.R.*

ARCTIC

See also: Soviet investigations, Arctic, 8.6-3; Canadian North (Arens), 8.6-23; Glacier res., Arctic (Baird), 8.6-81.

8.6-40

551.5:91.04(988)

Expéditions Polaires Françaises. Missions Paul-Émile Victor, Campagne préparatoire au Groenland, 1948. [Preparatory expedition to Greenland, 1948.] Its *Expéditions Arctiques, Publications Préliminaires*, No. 5, (Série Scientifique), 1948 (reprinted 1954). 79 p. figs., 34 photos, tables. **DWB**—Aims and operations of the preparatory expedition to Greenland in 1948 are reviewed and the glaciological (by **MICHEL PEREZ**) and meteorological (by **MICHEL BOUCHÉ**) programs outlined and illustrated in addition to reports on other programs connected with the expedition. Micrometeorological and surface wind and temperature observations, plus cloud observations were made during the summer of 1948. *Subject Headings*: 1. Greenland expeditions 2. Expéditions Polaires Françaises 3. Greenland. I. Victor Paul-Émile.—*M.R.*

8.6-41

551.5:91.04 (988)(99)

Expéditions Polaires Françaises. Missions Paul-Émile Victor, Terre Adélie, Groenland 1947-1950: rapport d'activités. [Adélie Land, Greenland, 1947-1950: activity report.] [Paris], B. Arthaud, 1956. 151 p. numerous illus. (incl. photos). **DWB**—An elaborate edition giving pictorial and tabular details of the numerous French polar expeditions from 1947-55 in Greenland, Iceland and the Antarctic, involving 10 separate expeditions (routes shown on global map and details on smaller maps) and 110 people (3 died) over 5200 days. The equipment and details of the meteorological, glaciological, upper atmosphere, oceanographic, atmospheric electricity, cosmic ray, climatological, optical and other programs are vividly illustrated and described. A list of place names and coordinates in the three areas is appended. *Subject Headings*: 1. Expéditions Polaires Françaises 2. Polar meteorological programs 3. Greenland 4. Adélie Land, Antarctica. I. Victor, Paul-Émile.—*M.R.*

8.6-42

551.501.9(1987)

Jacobsen, George (*Tower Co., Ltd.*), *Changing face of the Canadian Arctic*. *Royal Meteorological Society, Canadian Branch, [Publications]*, 6(4), April 28, 1955. 6 p. ref. DWB—Deals with advance of civilization in the far North, despite extreme climatic conditions. Arctic meteorological stations increase safety of flying, and runways on ice make landings possible. *Subject Headings:* 1. Arctic weather stations 2. Canadian Arctic.—A.A.

8.6-43

061.6:551.525.5(57)

Roberts, B. B. and Armstrong, T. E., V. A. Obruchev Institute of Permafrost Studies, Moscow. *Polar Record*, 8(55):362-363, Jan. 1957. DLC—Account of organization by 2 English visitors. Director is P. F. SHVETSOV. There are 3 departments: general permafrost studies, engineering permafrost studies, and laboratory, and a staff of 170 technical and scientific workers. The largest station is at Yakutsk. *Subject Headings:* 1. Obruchev Institute of Permafrost Studies, Moscow 2. Permafrost research 3. U.S.S.R.—C.E.P.B.

8.6-44

061.6(211.1)

Roberts, Brian and Armstrong, Terence, *The Arctic Institute, Leningrad*. *Polar Record*, 8(55):306-316, Jan. 1957. 3 photos. DLC—An outline of the work of the Arkticheskii Nauchno-Issledovatel'skii Institut. Its department of meteorology and weather forecasting, under A. A. GIRS, among other activities, is making 3-8 day forecasts. Department of oceanography, ice forecasting and river mouths is under A. F. LAKTIONOV and of geophysics under A. P. NIKOL'SKII. There is a large library and a museum. *Subject Heading:* 1. Arctic Institute, Leningrad.—C.E.P.B.

ANTARCTIC

See also: *Anarctica in the IGY*, 8.6-1; *Atmospheric pressure in Antarctic* (Hisdal et al.),

8.6-22; *Adélie Land-Greenland, 1947-1950*, 8.6-41; *Antarctic ice terminology* (Law),

8.6-59; *Surface and upper air wind obs., Port Martin and Adélie Land* (Boujon),

8.6-129.

8.6-45

91.04(99)

Fuchs, V. E., *Voyage of Trans-Antarctic Expedition's Advance Party to the Antarctic*. *Marine Observer*, 27(175):27, Jan. 1957. Also: Limbert, D. W. S., *Voyage of Royal Society's Advance Party to the Antarctic*. *Ibid.*, p. 28-31. fig., 3 photos., table. DWB—FUCHS describes voyage of the "Theron" from South Georgia on Dec. 20, 1955, to Filchner Ice-shelf where stores were unloaded. LIMBERT describes voyage of the "Tottan" from Southampton on Nov. 22, 1955, into Weddell Sea in 75°31'S, 26°36'W. A section shows variation of sea temperature with lat. from 35-75°S. *Subject Headings:* 1. Trans-Antarctic Expedition, 1955-58 2. Antarctic expeditions.—C.E.P.B.

8.6-46

550.3:061.3(99)

Fuchs, V. E., *The trans-Antarctic expedition, 1955-58: operations in 1956*. *Polar Record*, 8(55):356-357, Jan. 1957. Also: *International Geophysical Year, 1957-58: Antarctica, 1956*. *Ibid.*, p. 357-361. DLC—FUCHS describes the establishment of the advance party by the "Theron" in 1956. Surface meteorological observations began in March. The second paper describes the program and progress of the parties from Australia, France, Japan, New Zealand, Norway, United Kingdom, United States and U.S.S.R. *Subject Headings:* 1. Antarctic expeditions 2. Trans-Antarctic Expedition, 1955-58.—C.E.P.B.

8.6-47

551.582(699.2)

Heaney, J. B., *The Gough Island scientific survey, 1955-56*. *Polar Record*, 8(55):338-345, Jan. 1957. 2 figs., 4 photos. Also: Heaney, J. B. and Holdgate, M. W., *The Gough Island scientific survey*. *Geographical Journal*, 123(1):20-31, March 1957. 7 photos, map, bibliog. p. 30-31, discussion p. 31-32. DLC—A general description of the island includes a short paragraph on meteorology during Dec. through April 1955. *Subject Headings:* 1. Local climate 2. Gough Island, South Atlantic.—C.E.P.B.

8.6-48

91.04:69(99)

Law, Phillip, Australian National Antarctic Research Expedition buildings in Antarctica. *Polar Record*, 8(55):329-332, Jan. 1957. 4 photos. Also: United States buildings for Antarctica. *Ibid.*, p. 333-337. fig. DLC—Description and photos of four types of huts designed in Australia, incorporating successive improvements, are given in the first paper. The later types are built of plastic. The second paper describes American "Operation Deepfreeze II" buildings with plan of foundations. *Subject Headings*: 1. Antarctic expedition buildings. —C.E.P.B.

8.6-49

526:656.7(99)

Saffery, J. H., Falkland Islands Dependencies aerial survey expedition. *Shell Aviation News*, London, No. 219-27, Sept. 1956. 7 figs. DLC—Falkland Islands Dependencies covers sector 20 W-80 W, from 58-90°S, and includes Grahamland Peninsula. Survey by air photography started in 1955 from a base at Whalers Bay, Deception Island, with 2 Cansco Amphibians and a helicopter. Assembling base and initial operations are described. *Subject Headings*: 1. Aerial surveying 2. Falkland Islands.—C.E.P.B.

8.6-50

551.584.32:551.311.17(99)

Taubert, Heinrich, Sowjetische Untersuchungen in der Bunger-"Oase" (Antarktika). [Soviet investigations in the Bunger "Oasis" (Antarctica).] *Petermanns Geographische Mitteilungen*, 100(4):329-334, 1956. fig., table. DLC—A review of Russian literature about an ice-free region of low hills and lakes in 66°0'-66°5'S, 100°0'-101°8'E. This Bunger "Oasis" of 775 km² has a definite local climate. In winter it does not differ much from surrounding ice, but in spring and summer in anticyclonic weather the rocks warm up to 20°C and air temperature up to 5.6°C at midday in Jan. There is great ablation of firn fields. In summer the rocks thaw to a depth of 100 cm in dry places and 25-40 cm in the wettest places. A small lake warmed to 9.5°C. *Subject Headings*: 1. Microclimatology of ice "oases" 2. Antarctica.—C.E.P.B.

8.6-51

551.311.18(269)

Wordie, J. M., Ice in the Weddell Sea. *Marine Observer*, 27(175):31-33, Jan. 1957. DWB—Expectation of accessibility of Coats Land by an open coastal channel was borne out by the voyage of the "Tottan." *Subject Headings*: 1. Antarctic sea ice 2. Weddell Sea.—C.E.P.B.

CONFERENCES AND SYMPOSIA

See: Antarctica in the IGY, 8.6-1; Seminars in met., 8.6-4; Conferences on IGY (Sans Huelin), 8.6-36.

SOCIETIES AND SERVICES

See: Met. Off. and IGY (Sutton), 8.6-37; Arctic Inst., Leningrad (Roberts, Armstrong); C. Bertram . . . Scott Polar Res. Inst. (Roberts), 8.6-52; Agromet. and weather serv., U. S. (Haude), 8.6-87; Comm. on Topoclimat., W. Ger. (Schneider), 8.6-331.

EDUCATION, HISTORY AND BIOGRAPHY

BIOGRAPHY

8.6-52

061.6(211):92

Roberts, B. B., Colin Bertram: an appreciation. *Polar Record*, 8(55):305, Jan. 1957. photo. DLC—A new constitution for the Scott Polar Research Institute comes into force in 1957, requiring a full-time Director. Colin Bertram, part-time Director since 1949, resigned on Dec. 31, 1956. *Subject Headings*: 1. Scott Polar Research Institution 2. Bertram, Colin.—C.E.P.B.

8.6-53

551.5:92 551.509.32:551.515.2

Hogan, Joseph T., I. M. Cline, expert on hurricanes. *Science*, Wash., D. C., 122(3173): 53, Oct. 1955. DLC—High points in the remarkable life of ISAAC MONROE CLINE, who died in New Orleans on Aug. 3, 1955 at the age of 94, are brought out in this note. He was born in Monroe County, Tenn., on Oct. 13, 1861, received a B.A. degree from Hiwassee College in 1882 and a medical degree from the Univ. of Arkansas in 1885. He served 53 years in the U. S. W. B., retiring in 1934 and to devote the rest of his life to an art shop and to retreating famous American paintings. He successfully forecast the Galveston hurricane of Sept. 8, 1900, the hurricane in which he suffered the loss of his wife. He also forecast several other hurricanes, and floods of the Mississippi. He was the author of several books. *Subject Headings*: 1. Biography of Isaac M. Cline 2. Hurricane forecasting.—M.R.

8.6-54

551.5:92

Sutton, O. G., Obituary [of] Mr. Arthur John Lander, M.B.E. *Meteorological Magazine*, London, 86(1015):28, Jan. 1957. DWB—Died Nov. 5, 1956, aged 57. Entered the Meteorological Office in 1920 and served at Porton for 15 years, developing a talent for designing and making instruments. In 1955 became Head of Instrument Supply and Testing Branch. *Subject Headings*: 1. Obituaries 2. Lander, A. J.—C.E.P.B.

8.6-55

551.311.1:92

Otto Yul'yevich Shmidt [Obituary.] *Polar Record*, 8(55):378, Jan. 1957. DLC—Born 1891, died Sept. 7, 1956. Occupied various senior civil service posts in Russia, also interested in glaciology. Led many Arctic expeditions, and after "purging" in 1939 turned to geophysics and astronomy. "The strong position which the U.S.S.R. now holds in all fields of polar research and exploitation is in no small measure due to his work and influence." *Subject Headings*: 1. Obituaries 2. Schmidt, O. Iu.—C.E.P.B.

8.6-56

551.5:92

Robinson, Donald (former chief historian for U. S. Military Govt.), VIP: the world's 100 most important people. *Look*, N. Y., 19(20):34-45, Oct. 4, 1955. (p. 42, photo of Carl-Gustaf Rossby.) Also: Man's milieu. *Time*, N. Y., 68(25):68-79, Dec. 19, 1956. numerous photos, map. DLC—Among the 100 "Most Important People in the World" whose careers and pictures are included in the first article, are 26 in public affairs, 9 in military, 15 in economics, 7 in philosophy, 15 in journalism, 11 in science, 14 in arts and letters, 8 in health and 5 in religious activities. Among the 11 in science is Dr. CARL-GUSTAF ROSSBY, 57 years old. "A meteorologist, he pioneered in long range weather forecasts." Only 43 of the 100 who were included in the 1953 list, are on this list. Second article is a nicely illustrated "popular science" article on the importance of meteorology and the contributions of C.-G. ROSSBY to the development of the science. Many personal biographical details are included. *Subject Headings*: 1. Rossby, Carl-Gustaf 2. Biography of C.-G. Rossby.—M.R.

NEW SERIALS

8.6-57

551.521(05)

The Journal of Solar Energy Science and Engineering, Phoenix, Ariz., Vol. 1, No. 1, Jan. 1957. Quarterly (?) Pub. by the Association for Applied Solar Energy, 3424 N. Central Ave., Phoenix. Editor, Jean Jensen. Price: (to non-members) annual, \$10.00; single issue, \$3.00. Includes original papers, brief abstracts of papers published elsewhere, and news notes. DWB. Also: The Sun at Work: Newsletter of the Association for Applied Solar Energy. Vol. 1, No. 1, March 1956. Latest issue seen, Vol. 1, No. 4, Dec. 1956. Quarterly. about 15 p. each. Editor, Guy Benveniste. DLC—The Journal of Solar Energy Science and Engineering is a scientific publication containing original papers and extensive abstracts of papers originally printed elsewhere. The first numbers contains 8 articles (listed in this issue, Pt. III, p. 849) on solar variations, solar energy utilization equipment, photosynthesis, etc. The second issue will contain the Proceedings of the Solar Furnace Symposium held in Phoenix, Jan. 21-22, 1957. The Sun at Work is the newsletter of the Association of Applied Solar Energy. Its chief purpose is to publish news of the association as well as information about

people and events in the broad field of solar energy. *Subject Headings:* 1. Solar energy serials 2. Serial publications 3. Journal of Solar Energy Science and Engineering. I. Association for Applied Solar Energy, Phoenix, Ariz.—*M.R., I.L.D.*

BIBLIOGRAPHY AND DOCUMENTATION

See: Bibliog. on solar physics (Unsöld), 8.6-11; Angel bibliog. (Plank), 8.6-28; Jet stream bibliog. (Rodríguez Franco), 8.6-204.

8.6-58

551.5:025.45

Universal decimal classification, 551.5, Meteorology. *Meteorological Magazine*, London, 86(1015):22-24, Jan. 1957. 6 refs. DWB—List of the revisions prepared by W.M.O. Commission for Bibliography and Publications in 1953 and agreed to by the International Federation for Documentation. The main changes are extensions to 551.509.3 and 551.510.5, and subdivision of 551.511 and 551.551. *Subject Heading:* 1. U.D.C. for meteorology.—*C.E.P.B.*

8.6-59

551.311.1:001

Law, P. G., Antarctic ice terminology: "iceberg tongues." *Polar Record*, 8(55):375-376 Jan. 1957. 2 photos. DLC—Proposes term "Iceberg tongue" for an "ice-stream" projecting into the sea as a number of discrete mounts of ice heavily crevassed, and generally joined by thin fast ice. *Subject Headings:* 1. Ice terminology 2. Iceberg tongues 3. Antarctica.—*C.E.P.B.*

8.6-60

551.311.1:001.4:551.5:061.3

Nusser, Franz, Eine neue internationale Eisnomenklatur. [A new international ice nomenclature.] *Deutsche Hydrographische Zeitschrift*, 9(4):174-182, 1956. DWB—The German version of the W.M.O. Ice nomenclature is presented. Each German term is followed by its English equivalent. The definitions follow, arranged alphabetically under the English term. *Subject Headings:* 1. Ice terminology 2. WMO ice definitions.—*C.E.P.B.*

8.6-61

551.5:02

Rigby, Malcolm (*Met. Abstracts and Bibliog., Washington, D. C.*), Use of micro-opaque cards in meteorology. *World Meteorological Organization, WMO Bulletin*, 5(2):53-60, April 1956. 3 photos. DWB—The uses, advantages, and limitations of micro-opaque cards in the storage and dissemination of meteorological literature and data of all kinds are discussed in the light of 5 years of experience with this form of documentation by the staff of *Meteorological Abstracts*. The cards, readers, filing, selection, storage, loans, distribution, space-saving, copyright, cost and some technical details of processing and distribution are treated seriatim. Photographs of microcard readers (hand and desk models) in use are included along with a full size reproduction of a microcard and the corresponding bibliographic control card and abstract which is laminated on the back. *Subject Headings:* 1. Microcard uses in meteorology 2. Documentation 3. IGY data control. I. Thuronyi, G. T.—*M.R.*

HISTORY

See: History of ballooning, 8.6-133.

APPLIED METEOROLOGY

ASTRONAUTICS

8.6-62

551.501.7:551.507.362:551.510.53

Boyd, R. L. F., British plans for upper atmosphere rocket research. *Discovery*, 17(2):67-69, Feb. 1956. 2 figs. DLC—The British rocket is designed to carry a load of 100 lb to 210 km. Among the subjects to be studied at Woomera will be upper winds by grenades, iono-

pheric structure, and airglow with photoelectric photometers. *Subject Heading: 1. Rocket research.*—C.E.P.B.

8.6-63

551.507.36

Kelly, Joseph J. (*Martin Co., Md.*), *Earth satellites*. *Weatherwise*, Boston, 8(5):121-122. Oct. 1955. photo. DWB—The value of an earth satellite to meteorology is discussed. Suggested measurements include analysis of specific infrared band from earth, "strength and direction of the high frequency radio communications link as it sweeps through the atmosphere," measurement of solar radiation outside the atmosphere, influence of meteoric dust upon the attenuation of radiation. *Subject Heading: 1. Satellite observatories.*—I.L.D.

8.6-64

551.507.36:629.19

Singer, S. F., *The artificial earth satellite*. *Discovery*, 17(4):140-145, April 1956. 7 figs. DLG—A description and plan of MOUSE are given, with an account of its 90-min orbit and the path swept out. Knowledge to be gained about radiation and corpuscles outside nearly all the atmosphere is discussed, this will be especially important in study of cosmic rays. *Subject Headings: 1. Satellite observatories 2. Project MOUSE.*—C.E.P.B.

8.6-65

629.19

Lawden, Derek F., *Entry into circular orbits, Pt. 1*. *British Interplanetary Society, Journal*, 10(1):5-17, Jan. 1951. 6 figs., 4 refs., 31 eqs. DLG—A mathematical analysis is offered of the velocity which is necessary to make a rocket enter from the earth's surface into a circular orbit. It is found that as the radius of the orbit becomes about 3 times that of the earth's, the fuel requirement exceeds that necessary to achieve direct escape velocity. The values obtained are applied to the case of a rocket which ascends vertically from the quator with steady acceleration 2 g. to a height of 100 mi. *Subject Headings: 1. Rocket research 2. Astronautics.*—G.T.

AERONAUTICAL METEOROLOGY

See also: Aerial surveying, Antarctic (Soffery), 8.6-49; *Met. and the Martin Co.* (Kelly), 8.6-99; *Anisotropic high-level turbulence* (Clodman), 8.6-247; *Pilots' reports of high-alt. clear-air turbulence* (Press et al.), 8.6-248; *Turbulence in convective clouds* (East), 8.6-275; *Icing of aircraft* (Perkins), 8.6-283; *Cloud height-visibility relationships* (Reshchikova, Tonkova), 8.6-344.

8.6-66

551.524.7:551.557:629.135.2

Crossley, A. F., *Temperature-compensated equivalent headwinds for jet aircraft*. *Great Britain. Meteorological Office, Meteorological Reports*, 3(17), 1956. 10 p., 2 tables, 8 refs., 6 eqs. DWB—For low-powered jet aircraft the effect of an increase of air temperature is expressed in terms of the equivalent headwind. These formulas are then adapted to a flight in which pressure altitude varies, and applied to air-route operation, with the example London-New York and New York-London in July. *Subject Headings: 1. Jet aircraft 2. Temperature-compensated equivalent headwinds.*—C.E.P.B.

8.6-67

629.13

Fry, R. H. and Wells, P. J., *Dead reckoning procedures in air navigation*. *Institute of Navigation, London, Journal*, 7(4):324-335. Oct. 1954. 8 figs., 2 refs. Discussion p. 331-335. DWB—Account of methods of calculating position of aircraft from air speed and direction, fixes and adjustment by wind finding and wind forecasts. *Subject Heading: 1. Aerial navigation.*—C.E.P.B.

8.6-68

551.575.36:551.553.6(439.1)

Hille, Alfréd, *Köd- és szélgyakoróság a Férihegyi repülőtéren*. [Frequency of fog and wind at Férihegy airport.] *Beszámoló az 1955-ben végzett tudományos kutatásokról* (issued as *Hungary. Országos Meteorológiai Intezet, Hivatalos Kiadványai*, Vol. 20, pub. 1955), p. 262-

267. 4 figs. Russian and German summaries p. 262. DWB—Fog and turbidity frequency data for Budapest-Ferihegy airport are graphically presented as functions of wind direction (1951-1953). *Subject Headings: 1. Fog wind roses 2. Budapest, Hungary.—G.T.*

8.6-69

551.55:527:629.1

Maya, E. D., *The accuracy of dead reckoning in the air.* *Institute of Navigation, London Journal*, 10(1):84-89, Jan. 1957. Comments by C. S. Durst, p. 89-91, 2 tables, 3 refs. Comments by J. B. PARKER, p. 91-93. DWB—Referring to J. B. PARKER (*Inst. of Navigation Journal*, 8(2):113-116, April 1955), MAYA discussed dead reckoning over Africa. In region of big discrepancies between forecast and observed winds, deviations from DR positions of order of 60 naut. mi. in 1 hr flight may be expected. In other regions errors of forecast wind are small and winds are not strong. Safety precautions are considered. DURST gave a table of standard vector deviations on African routes at 500 and 700 mb. PARKER discussed economics of track separation. *Subject Headings: 1. Aerial navigation. I. Durst, C. S. II. Parker, J. B.—C.E.P.B.*

8.6-70

551.501.45:551.58:656.71

Tardos, Béla, *Az éghajlati adatok szerepe a repülőterek futópályáinak méretezésében* [Role of climatological data in determining the size of airfield runways.] *Beszámoló a 1955-ben végzett tudományos kutatásokról* (issued as *Hungary. Országos Meteorológiai Intézet Hivatalos Kiadványai*, Vol. 20, pub. 1955), p. 268-271. eqs. Russian and French summaries p. 268. DWB—The use of a formula (recommended by International Civil Aviation Organization) for calculating the required length of airfield runways is explained. The formula is composed of the required length at sea level under normal atmospheric conditions, and corrections for elevation, atmospheric temperature and density, and inclination of the runway (however, the author uses maximum noon-time temperature and the corresponding pressure rather than the average values for the hottest summer month as suggested by ICAO). The total correction factor is calculated for six commercial airports in Hungary and found to be close to 1.5 in each case. Hence runways anywhere in Hungary should be planned at 1.5 times the length of the theoretical sea-level runway requirement. *Subject Headings: 1. Airport climatology 2. Airport runway calculation.—G.T.*

8.6-71

551.5:629.13

Williams, J. E. D., *Navigational aspects of turboprop operation on the North Atlantic* *Institute of Navigation, London Journal*, 10(1):31-46, Jan. 1957. 5 figs. Discussion p. 46-49. DWB—The optimum trajectory is determined by wind, temperature and pressure fields, aircraft performance, etc. Optimum flight path is defined as compatible with all airspace restrictions, insensitive to forecast error, satisfactory from the point of view of weather, icing etc., and least time acceptable path. Time saved over Great Circle flying, Britannia N Atlantic, averages 1.03 hrs. Advantages of flying at different heights are discussed. *Subject Heading: 1. Aerial navigation.—C.E.P.B.*

OCEANOGRAPHY

See also: General oceanography (Dietrich), 8.6-7; *Oceanographic work in IGY* (Böhnecke), 8.6-32; *Oceanography in IGY* (Deacon), 8.6-33; *Temp. anomaly, N. Atlantic* (Rodewald), 8.6-239; *Calm zone, Atlantic Ocean* (Schnapsuff), 8.6-254; *Dependence of size of sea waves upon wind intensity, N. Atlantic* (Roll), 8.6-258.

8.6-72

551.526.6(491)

*Stefánsson, Unnstein, *Temperature variations in the North Icelandic coastal area.* *Reykjavík, Iceland. Atvinnudeild Háskólans. Fiskideild, Rít Fiskideildar*, 2(2), 1954. 27 p. 17 figs., 26 refs. DWB—A thorough study of sea surface temperatures in various sections of the sea north of Iceland, for the years 1871-1950, using 1901-30 data as "normal." Since sea surface data are not plentiful, except in summer, data for Grimsey Island (66°32'N 18°00'W, 23 mi off the N. coast) where sea surface temperature data has been obtained regu-

larly since 1874, is used in most of the study. Occasionally ice has prevented observations even there. Sea temperature reaches a maximum in Aug. (7–8°C) but air temperature exceeds sea temperature only in June and July (maximum in July). Ten- and 30-year moving averages show a decline in mean temperature from 1875–1900, fluctuations until 1920 and then a marked rise to 1940, with greatest increase in late spring and early summer. Local and seasonal differences are noted. Charts show changes in air pressure, frequency of SW winds and in wind speed, and in drift ice which attends the remarkable air and sea temperature changes. *Subject Headings:* 1. Warming of Arctic 2. Sea surface temperatures 3. Iceland coasts.—*M.R.*

8.6-73

551.526.6(491)

*Stefánsson, Unnstein, *Yfirbörðshiti sjávar við strendur Íslands árin 1949–1953*. [The sea surface temperature in Icelandic coastal waters during 1949–1953.] *Reykjavík, Iceland. Atvinnueld Háskólans. Fiskideild. Fjölrit Fiskideilda*, No. 4, 1954. 23 p. 13 figs., 3 tables, 6 refs. English summary p. 20–22. **DWB** Sea surface temperature records made on self-recording thermographs on 2 Icelandic coastal steamers in 1949–1953 are analyzed and compared with data from 23 coastal stations around the entire circumference of Iceland. The seasonal and year-to-year changes in air and sea temperature on the 4 separate coasts are shown graphically and correlated. Local differences are explained. On the S. coast temperatures are uniform from Dec. to April (minimum in Feb.), on the W. coast the minimum is in March and on the N. and E. coasts in April. The warming in the spring is faster than the cooling in the autumn. Difference between sea and air temperature is greatest on the S.W. coast. The sea temperature was highest in 1953. *Subject Headings:* 1. Sea surface temperature data 2. Sea-air temperature difference 3. Icelandic language 4. Iceland coasts.—*M.R.*

8.6-74

532.593:627.2

McNown, John Stephenson, *Sur l'entretien des oscillations des eaux portuaires sous l'action de la haute mer*. [On the interaction of waves in harbors under the influence of the open sea.] *France. Ministère de l'Air, Publications Scientifiques et Techniques*, No. 278, 1953. 44 p. 14 figs. (incl. photos), 2 tables, 16 refs., 27 eqs. **DLC**—An extensive theoretical and empirical study of movements of water in ideal harbors under the influence of internal and external forces. Computations entering into the construction of the model are given in appendix. Shapes and depths of harbors, currents and interference (seiches) figure in theory. *Subject Headings:* 1. Seiches in harbors 2. Waves in harbors. I. Kravtchenki, Julien.—*M.R.*

8.6-75

551.556.8ö:532.59:518.3

Piest, Jürgen, *Berechnung der Bandbreite des Periodenspektrums in ozeanischer Dünung mit Hilfe eines Nomogramms*. [Calculation of the band-width of the period spectrum of oceanic swell with the aid of a nomogram.] *Deutsche Hydrographische Zeitschrift*, 9(4):189–194, 1956. 2 figs., 2 plates, 4 refs., 7 eqs. German, English and French summaries p. 189. **DWB**—Construction of a nomogram is described for use where the history of a swell-generating wind field is known. It consists of two plates and a transparency. Full instructions for use are included. *Subject Headings:* 1. Wind effects on water surfaces 2. Ocean swell period 3. Nomograms.—*C.E.P.B.*

8.6-76

551.508.26:551.526

Sabinin, K. D. and Zalogin, B. S., *Ispytanie opytnykh obraztsov batitermografov TB-52 v morskikh usloviakh*. [Testing of experimental TB-52 bathythermographs under marine conditions.] *Meteorologiya i Gidrologiya*, Leningrad, No. 5:58–60, Sept./Oct. 1955. 2 figs. **DWB, DLC**—This bathythermograph was suspended from the side of a stationary vessel and the temperatures recorded were compared with those registered by thermometers suspended at identical levels. A comparison of the temperature curves indicates the need for a correction to be applied to the bathythermograph record. The variation of this correction with depth is analyzed. Also the bathythermograph was tested similarly from a moving vessel. Special

precautions for the use of the bathythermograph are presented. *Subject Headings:* 1. Bathythermographs 2. Instrument comparisons.—*I.L.D.*

8.6-77

535:551.463

Sasaki, Tadayoshi; Okami, Noboru; Watanabe, Seiichi and Oshiba, Gohachiro, **Optical properties of the water in the Kuroshio current.** *Records of Oceanographic Works in Japan*, Tokyo, N.S., 2(2):133-140, Oct. 1955. 11 figs., 2 tables, 4 refs. DWB—A high-sensitivity underwater photometer with Kaken monochromatic filters (violet, blue, green, yellow and red) was used in the Kuroshio region just off the coast of Japan (E. of Izu Peninsula) to determine extinction coefficients and transmission in various sectors of the Kuroshio. Each filter had a spectral range of about 1000Å with a sharp peak of transmittance in the central portion of the band. Blue light showed greatest penetration at a station 1.5 mi. from Shimoda and 0.5 mi. off Atami and Ajiro. Mean values of extinction for red light were 8 times that for blue. Extinction of blue light at Atami was 1.8 times that in open sea. Values agree with minimum values obtained by UTTERBACK. *Subject Headings:* 1. Optical properties of sea water 2. Submarine photometers 3. Light extinction in sea 4. Kuroshio Current. —*M.R.*

8.6-78

551.556:551.465

Veronis, G. and Stommel, Henry (both, *Inst. for Advanced Study, Princeton, N. J.*), **The action of variable wind stresses on a stratified ocean.** *Journal of Marine Research*, New Haven, Conn., 15(1):43-75, Oct. 1956. 3 figs., 2 tables, 17 refs., numerous eqs. DWB, DLC—The forced response of a horizontally infinite ocean on a rotating earth to a transient wind system is investigated. In an equilibrium state, the ocean consists of two homogeneous layers of fluid of finite depth, the fluid in the lower layer being slightly denser than that in the upper. The wind system is periodic in space and its time-dependence is periodic or is given by a step function. Little energy goes into the inertia-gravity waves for winds that blow longer than a half pendulum day; most of the energy appears as geostrophically balanced Rossby (planetary) waves. Wind systems with periods from a day to a year excite motions which are in part barotropic and in part baroclinic. Winds of long period (100 years or more) excite the (internal) baroclinic Rossby mode, in which the currents are confined to the upper layer. The applicability and oceanographic implications of the model are discussed quantitatively. *Subject Heading:* 1. Wind driven currents.—*Authors' abstract.*

8.6-79

551.465:532.593:551.509.39

Saville, Thorndike, Jr., **The effect of fetch width on wave generation.** *U. S. Beach Erosion Board, Technical Memorandum*, No. 70, Dec. 1954. 9 p. 2 figs., 3 tables. DWB—Since waves are often generated at an angle to as well as in the direction of the wind, the fetch width must be considered as well as the fetch length whenever the generating basin is narrow in width compared to length. In the open ocean this is seldom the case, but in rivers, lakes and estuaries it often occurs. Tables and monograms are presented for determining the effect of fetch width on wave height as a factor in forecasting wave characteristics on inland waters. Wind effectiveness ($\cos \alpha$) up to 45° angle, is added to the fetch effectiveness. To give the total effectiveness, actual fetch shapes as well as the idealized rectangular shapes may be used, and sometimes the resulting fetch may be longer than that originally determined in an axis parallel with wind direction. *Subject Headings:* 1. Fetch width 2. Wave forecasting 3. Inland lakes.—*M.R.*

8.6-80

551.506:681.177(269)

Venter, R. J., **Meteorological data for the southern oceans: distribution with respect to time and region.** *South Africa. Weather Bureau, Notos*, 5(1):12-52, 1956. fig., 18 charts, 4 tables. DWB—A deck of more than 110,000 punched cards, containing a large percentage of all possible ships' observations for the southern oceans south of latitude 50°S and for the 35-year period Sept. 1920 to Aug. 1955, was used to study the distribution of these observations. The presentation of the results is intended to serve as a general guide to research workers interested in the availability of data for these regions. *Subject Headings:* 1. Punched card collections 2. Marine meteorological data 3. Southern Ocean.—*Author's abstract.*

GLACIOLOGY AND ICE

See also: Radiation processes on glaciers (Dirmhirn), 8.6-215; Radiation balance on glaciers (Untersteiner), 8.6-216; Hydrology and glaciology, Lago Argentino (Heinshemer), 8.6-314; Chogo-Lungma Glacier (Kick), 8.6-326; Dachstein Glacier (Moser), 8.6-327; Postglacial variations, Near East (Butzer), 8.6-328; Glacial periods (Himalayas), 8.6-329; Ice Age glacier traces (Weyl), 8.6-330.

8.6-81

551.311.12 551.584.34

Baird, P. D. (*Aberdeen Univ.*) and Sharp, R. P. (*Calif. Inst. of Technology*), **Glaciology. Arctic**, Montreal, 7(3/4):141-152, 1954. 6 figs. (incl. photo), 32 refs. **DLC**—The accomplishments of glaciological research expeditions in Greenland, Canada and Alaska since the end of World War II are reviewed and the nature of desirable research in glaciology is outlined. This includes studies on the velocity relations in glaciers, namely surface velocities, velocity relations in depth; study of structures within glaciers such as planar structures and crystal fabrics; phase relations in glacier ice; oxygen-isotope studies in snow, firn and glacier ice; and micrometeorology and the regime of glaciers. A brief summary is given of accomplishments in the various problems. Diagrams showing a section of the Greenland Ice Cap and of the Antarctic Ice Cap, and photographs of the North Dawes Glacier at various intervals are presented. *Subject Headings: 1. Glacier research 2. Microclimate of glaciers.—I.L.D.*

8.6-82

551.46:551.17/8

*Branson, P. S.; Dinsmore, R. P.; Pisicchio, Sam and Soule, Floyd M., **International ice observations and ice patrol service in the North Atlantic Ocean, season of 1951.** *U. S. Coast Guard, Bulletin*, No. 37, 1952. 85 p. 21 figs., (some fold.), tables. **DWB**—Description of ice and weather conditions, monthly charts showing the location of field ice, growlers and icebergs, monthly isotherms and a detailed table of ice reports, partly obtained by air reconnaissance. Only three icebergs drifted south of 48°N, compared with the normal of 433. A scientific paper on the **Physical oceanography of the Grand Banks region and the Labrador Sea in 1951** is added, giving dynamic topographies of the sea surface, oceanographic sections, heat transport, current charts, etc. with an extensive table of original data. *Subject Headings: 1. Sea ice 2. Oceanographic data 3. Sea temperatures 4. International Ice Patrol 5. Grand Banks, North Atlantic 6. Labrador Sea.—A.A.*

8.6-83

551.311.1:539.8

Royen, N., **Ice pressure with increasing temperatures.** *U. S. Snow, Ice and Permafrost Research Establishment, Translation*, No. 45, Aug. 1955. 11 p. 7 figs., 7 refs., eqs. **DLC**. Translation by Wilhelm Nupen of the original Swedish, *Istryck vid temperaturhöjningar, in Hyllningsskrift tillägnad F. Vilh. Nansen. Stockholm, Gunnar Tisells Tekniska Forlag, 1922.* p. 357-371. **DLC**—The ice cover expands during rising temperatures and causes pressure against dams and other hydrostructures. The maximum possible pressure, however, is not equal to the crushing strength times area of application, due to plastic relaxation effects in the ice. The dependence of the plastic deformation versus temperature stress and time is studied. The final computation shows a maximum pressure of 20-30 tons per linear meter, depending on thickness of ice. *Subject Headings: 1. Ice mechanics 2. Ice pressure 3. Hydrostructures 4. Translations. I. Nupen, Wilhelm (trans.).—A.A.*

GEOMAGNETISM

See also: Ionosphere research in IGY (Dieminger), 8.6-31; Geomagnetic variations in cosmic ray disturbance (Marsden et al.), 8.6-228; Diurnal geomagnetic variations (Maceda), 8.6-354; Auroras and geomagnetic disturbances (Rodewald, Breitkreutz), 8.6-367.

8.6-84

550.384:551.7

Steinert, Harald, **Fossile Magnete als Erdgeschichtszeugen.** [Fossil magnets as indicators of earth history.] *Umschau*, 57(4):101-103, Feb. 15, 1957. table, 6 refs. **DLC**—Thermoremanent magnetism in igneous rocks and magnetic orientation of grains in sediments

are described. In the long run the geographical poles must coincide with the magnetic axis. This enables us to trace movements of the pole. In Pre-Cambrian, 600 million years ago, it was in 130°W , 0° ; in Carboniferous $120-137^{\circ}\text{E}$, 36°N . The reality of these movements is confirmed by data from many distant localities, and they explain many paleoclimatic and geological problems. *Subject Heading: 1. Paleomagnetism.—C.E.P.B.*

8.6-85

550.38:517.514.3

Mauersberger, P., *Zur Bestimmung des potentiallosen Anteils des geomagnetischen Hauptfeldes.* [On the determination of the nonpotential part of the earth's main magnetic field.] *Beiträge zur Geophysik*, 65(4):295-308, 1956. 5 refs., 28 eqs. German and English summaries p. 295. **DLC, DWB**—A spherical harmonic analysis using the method of least squares turns out not to be fit for deciding the question exactly, if there is a nonpotential part of the earth's main magnetic field or not. *Subject Headings: 1. Geomagnetic field 2. Spherical harmonics.—Author's abstract.*

8.6-86

517.513:550.38

Zmuda, Alfred J., *Limiting form of Taylor series used in extrapolating components of the geomagnetic intensity.* *American Geophysical Union, Transactions*, 37(1):9-12, Feb. 1956. 2 tables, 3 refs., 29 eqs. **DWB, DLC**—In the extrapolation of geomagnetic components, a theoretical treatment of the Taylor series shows that the ratio of the absolute value of successive terms of the series approaches the limit h/a where h is the extrapolation distance and a is the radius of the earth. Expressions are presented for the limiting form of the remainder after a certain finite number of terms of the series. These expressions, which comprise the product of a computed term and a binomial series, may be used to limit the number of partial derivatives that need to be computed. *Subject Headings: 1. Taylor series 2. Geomagnetic field intensity 3. Extrapolation.—Author's abstract.*

AGRICULTURAL METEOROLOGY

See also: Crop-hail insurance (Roth), 8.6-101; *Water and micro-organisms* (Miller, Clark), 8.6-108; *Forest shelter belts on collective farms* (Markov, Lidov), 8.6-261; *Plant diseases in arid climates* (Reichert), 8.6-336.

8.6-87

551.5:63

Haude, W.; Kreutz, W. and Seemann, H., *Die Agrarmeteorologie und der Wetterdienst in der USA.* [Agricultural meteorology and the weather service in the United States.] *ALL Land- und Hauswirtschaftlicher Auswertungs- und Informationsdienst, e. V., Bad Godesberg Berichte über Studienreisen im Rahmen der Auslandschilfe der USA*, No. 70, 1955. 55 p. 33 figs. (incl. photos), 3 tables. **DWB**—This is the report of a survey of the status of agricultural meteorology in the U. S. carried out by the authors during April-July 1953 for the Federal Ministry for Nutrition and Agriculture (West Germany) under the auspices of the Mutual Security Agency Technical Assistance Program. Theoretical and applied studies in the following aspects of agricultural meteorology are described: water and heat balance including runoff, permeation, soil moisture and potential evapotranspiration; water and wind erosion; wind protection; relationship between climate and vegetation; phenology; air pollution; and plant growth; the interrelationship between plant diseases, pests and weather; frost warning system; climate and animal management; climate of enclosed spaces and storage green house climate; instrumentation for agricultural meteorological research; weather and crop yield; and the relationship between the Extension Service and agricultural meteorology. The report contains numerous photographs and also diagrams. A list is appended of reports of agricultural activities which visiting groups under the auspices of the Foreign Aid Program carried out in the U. S. *Subject Headings: 1. Agricultural meteorology 2. United States—I.L.D.*

8.6-88

551.586:63

Joos, L. A. (U. S. W. B., Madison, Wisc.), *Hay-drying weather at Madison, Wisc.* *U. S. Weather Bureau, Weekly Weather and Crop Bulletin*, 42(25):7-8, June 20, 1955. tables, diagr

DWB—Brief article on modern hay-drying methods and the use that farmers can make of weather records in hay-drying operations. Examples of such statistics (for Madison, Wisc., 1905 to 1950) are presented. Tables based on .01" or more rain per day and .10" or more for June, July and Aug. separately and combined show the percentage of favorable and of unfavorable days. Favorable days are dry days followed by at least 2 dry days. Unfavorable are rainy or dry days followed by rain within 2 days. The same statistics are shown by weeks in graph for June, July and Aug. *Subject Headings:* 1. Hay drying weather 2. Agricultural meteorology 3. Madison, Wisc.—M.R.

8.6-89

551.584:63

Száva-Kovács, József, *Mesterséges talajközeli légállapotok a növénytermelés szolgálatában.* [Artificial atmospheric conditions near the ground promote crop farming.] *Természet és Technika*, Budapest, 109(3):175-179, March 1950. illus., 3 diagrs. **DLC**—Report on an experiment carried out in Hungary in 1948 and 1949. Spaces between plants in a tomato field were covered with special aluminum sheets having high reflectivity. Data on heat balance, air and soil temperature, and soil moisture as affected by the application of the experimental technique are presented and discussed. The experimental field delivered a two-fold crop as compared to the yield of a control field. *Subject Headings:* 1. Microclimatic control 2. Crop yield.—G.T.

8.6-90

551.524.37:633(439.1)

Szilágyi, Tibor, *Az 1953. évi későtavaszi fagyok agrometeorológiai értékelése.* [Agrometeorological evaluation of the late spring frost in 1953.] *Beszámoló az 1955-ben végzett tudományos kutatásokról* (issued as *Hungary. Országos Meteorológiai Intézet, Hivatalos Kiadványai*, Vol. 20, pub. 1955), p. 86-90. 3 figs. Russian and German summaries p. 86. **DWB**—Maps of Hungary show magnitudes and dates of surface freezing temperatures at over 50 stations (May 9-15, 1953), lowest surface temperature readings at 1.5-2 m above the ground during the same period. The effect of the freezes on various plants is discussed and found to be moderate. *Subject Headings:* 1. Spring frosts 2. Frost damage to crops 3. Hungary:—G.T.

8.6-91

581.1

Varga, Miklós, *A hideg talajok fiziológiai szárazságáról.* [Physiological dryness of cold soils.] *Időjárás*, 56(5/6):167-168, May/June 1952. **DWB**—Review of W. P. DADYKIN, *Water economy and nutrition of plants in cold soils*, published in *Akad. Nauk SSSR*, No. 6, 1950 and in *Sowjetwissenschaft*, No. 3, 1950. In a series of experiments, DADYKIN reached the conclusion that poor development of plants in cold soils is due to slow absorption of nutrients rather than to "physiological dryness" as maintained by SCHIMPER. *Subject Headings:* 1. Plant growth 2. Soil moisture deficiency 3. Plant nutrition 4. Reviews.—G.T.

8.6-92

551.5:63

*Okushko, A. A. (ed.), *Voprosy sel'skokhoziaistvennoi meteorologii.* [Problems of agricultural meteorology.] *Leningrad. Tsentral'nyi Institut Prognozov, Trudy*, 37(64), 1954. 45 p. numerous tables. refs. at end of some chs. **DLC**—Articles abstracted separately. (For contents, see this issue of *MAB*, Pt. III, p. 849.) *Subject Headings:* 1. Agricultural meteorology 2. U.S.S.R.

FOREST METEOROLOGY

8.6-93

634.94:551.579.5

Hayes, G. L. and Buell, Jesse H. (both, *U. S. Forest Service*), *Trees also need water at the right time and place.* *U. S. Dept. of Agriculture, Water: the Yearbook of Agriculture*, 1955:219-228, pub. 1955. **DA, DWB**—Transpiration from forests is discussed in relation to tree growth, size and climatic factors. Where air is dry and winds strong, trees do not grow tall, but where moist or calm conditions prevail, trees grow big. Greatest growth is in winter. THORNTWAITE's classification of climates is examined in relation to tree growth, and the different zones of the earth, and especially of the U. S. are discussed at greater length. Increased success in tree growth can be attained if areas with sufficient soil moisture are used for planting,

and if cultivation and conservation of moisture are properly carried out. In dry areas (16"-18" precipitation per year) drought years may be critical, for fallowing cannot be practiced as in grain cultivation. In moist areas, shrubs and other weeds must be kept down. *Subject Headings:* 1. Tree growth 2. Forest meteorology 3. Transpiration of trees 4. Soil moisture. —M.R.

8.6-94

551.588.6:551.556:551.571

†L'vovich, M. I., *Izmenenie vetrovogo i vodnogo rezhima territorii pod vlianiem agrolesomelioratsii*. [Change of wind and water regime of a region as a result of agricultural and forest amelioration.] *Akademiia Nauk SSSR, Institut Geografii, Trudy*, No. 64:5-68, 1955. 3 figs., 26 tables, bibliog. p. 65-68, eqs. **DLC**—A comprehensive review of the literature dealing with wind protection afforded by forest strips, the possibility of increasing atmospheric precipitation by afforestation, the effect of forest strips upon snow accumulation, changes in evaporation from fields under different types of cultivation, including the analysis of the relationship between evaporation and transpiration and evaporation and soil moisture content, change in surface runoff, changes in the feeding of rivers by underground waters and the transformation of the water balance. The article contains extensive experimental data from the available literature and formulas expressing the various relationships and physical processes examined. *Subject Headings:* 1. Wind protection 2. Afforestation 3. Forest strip effects 4. Bibliographies.—I.L.D.

8.6-95

551.579:551.588.6

*Stålfelt, M. G., *Granes vattenförbrukning och dess inverkan på vattenomsättningen i marken*. [Water consumption of the spruce and its influence on the water economy in soils.] (K.) *Lantbruksakademien, Stockholm, Tidskrift*, 83(6):425-505, 1944. 14 figs., 20 tables, bibliog. p. 503-505. **DLC**—Results of measurements (1938-41) of transpiration and interception of eleven 40-year old spruces, 8 of which grew where depth to groundwater was 2-7 m and 3 where it was only 0.2 m, are presented tabularly and discussed. Evaporation exceeds precipitation. Comparative measurements show that the precipitation (May-Aug.) reaching the root system was 43% and 24% of the transpiration from the trees at the dry and the moist ground, respectively. *Subject Headings:* 1. Forest hydrology 2. Hydrologic cycle 3. Transpiration of forests.—W.N.

8.6-96

551.585:634.94(213)

Wendelbo, Per, *Litt om den tropiske regnskog og dens fremtid*. [Contribution on the tropical rain forest and its future.] *Naturen*, Bergen, 79(7):203-212, 1955. 4 figs., table. **DLC**—The destructive influence of civilization on existing rain forests as related to problems of the earth's flora, soil erosion and climate is discussed in general. The article is based on P. W. RICHARD: *The tropical rain forest*. (See 4.11-12, Nov. 1953, *MAB*.) *Subject Headings:* 1. Tropical climatology 2. Forest ecology 3. Rain forest climate.—W.N.

INDUSTRIAL METEOROLOGY

See also: Weather damage (Terada), 8.6-18; Radioactive fallout, U. S. (List), 8.6-26; Warehouse climates (Westbrook), 8.6-332.

8.6-97

551.524.36:551.586:628.8:697

Great Britain. Ministry of Works, *Basic design temperatures for space-heating*. By a Study Committee convened by the Councils of the Institution of Mechanical Engineers, the Institution of Electrical Engineers, the Institution of Gas Engineers and the Institution of Heating and Ventilating Engineers. Its *Post-war Building Studies*, No. 33, 1955. 89 p. 8 figs., tables, refs. **GB-MD**—This Report by a Committee under Chairmanship of SIR DAVID BRUNT is mainly concerned with external air temperatures to be assumed in design of space-heating installations in the United Kingdom. The lowest air temperature against which internal temperature has to be maintained is the "basic design temperature." Effects of altitude, exposure, etc. are considered. Buildings are classified as having thermal time-lags of 1 or 2 days. The bulk of the work consists of statistics of cold days (mean 24-hr temperature

$\leq 32.4^{\circ}\text{F}$) and periods of cold weather at Aberdeen, Aldergrove, Birmingham, Bristol, Cockle Park, Edinburgh, Kew and Manchester 1925/6-1949/50. Average number of days and periods with daily mean temperature below basic design temperatures are tabulated. *Subject Headings: 1. Temperature control 2. Temperature frequencies 3. British Isles. I. Brunt, Sir David.—C.E.P.B.*

8.6-98

551.58(73)

Cooke, Alistair, *Letter from America. Weather*, 12(2):52-55, Feb. 1957. DWB—Recorded talk on British Home Service, March 1, 1956, dealing with extremes of American climate compared with British, refrigeration, and "switch burners" to keep railways running in severe frost. *Subject Headings: 1. Climatic extremes 2. United States.—C.E.P.B.*

8.6-99

551.542:531.56

Kelly, Joseph J. (*Advanced Design Dept., Martin Co.*), *Meteorology and the Martin Company. American Meteorological Society, Bulletin*, 37(1):39-40, Jan. 1956. photo. DWB, DLC—In the design of air-borne weapon systems the magnitude, type and frequency of variation of atmospheric parameters must be considered. The assumption of "standard" atmospheric conditions or basing the capabilities of aircraft upon still air performance are inadequate operational concepts for weapons systems. The utilization of pressure pattern light techniques in missile or manned aircraft is an indication for a new approach. *Subject Heading: 1. Pressure pattern ballistics.—I.L.D.*

8.6-100

621.47

Raisbeck, Gordon, *The solar battery. Scientific American*, N. Y., 193(6):102-110, Dec. 1955. 9 figs. DWB, DLC—A battery built on the principle of the junction transistor, of a thin wafer of silicon, arsenic and boron. The junction is at the boundary between the Si-As body and the SiBo coat, Si crystals. The ordinary photoelectric cell is only $\frac{1}{2}$ of 1% efficient, whereas the solar battery is 10% efficient and can generate electric power at 90 watts/sq yard of surface illuminated. About 45% of the solar energy can be turned into electric currents at the crystal junction, but losses bring the efficiency down to a maximum of 20% or less. It is not practical now, as enormous storage batteries would be needed for cloudy periods, but it would be ideal for small currents needed in remote and inaccessible places, as it would never run down. *Subject Heading: 1. Solar battery.—M.R.*

8.6-101

551.578.7:368

Roth, Richard J. (*Chairman of Committee on Agr. Met. of the Amer. Met. Soc.*), *Crop-Hail Insurance Actuarial Association. American Meteorological Society, Bulletin*, 36(8):409-411, Oct. 1955. 2 photos. DWB—The organization, activities and research program and personnel of the Crop-Hail Insurance Actuarial Association are described. *Subject Headings: 1. Crop-hail insurance 2. Crop-Hail Insurance Actuarial Association.—I.L.D.*

8.6-102

551.5:639.2

Seilkopf, H., *Über die Seefischproduktion in ihrer Abhängigkeit von meteorologischen Gegebenheiten.* [Sea fish production in its dependence on meteorological factors.] *Wetterlotse*, No. 92:176-179, Sept. 1955. DLC—The phytoplankton supply on which fishes feed depends on sun- and sky-light and the supply of chemicals. These are brought mainly by rising ocean currents and the localities of such currents form rich fisheries. They vary from year to year according to the weather. *Subject Headings: 1. Weather effects 2. Fisheries.—C.E.P.B.*

8.6-103

551.5:639.222.2(261.2)

Seilkopf, H., *Von Heringsfang in seiner Abhängigkeit von der Witterung.* [Dependence of the herring fishery on weather.] *Wetterlotse*, No. 108:232-233, Nov. 1956. fig. DLC—The herring catch of 1956 was poor owing to storminess in the North Sea, especially in Aug. Mean monthly pressure charts are given for Aug. 1956, 1954 and 1952 (bad years, cyclonic) and 1951, 1953 and 1955 (good years, anticyclonic). *Subject Headings: 1. Weather effects 2. Herring fisheries 3. North Sea.—C.E.P.B.*

MEDICAL METEOROLOGY

See also: **Climate and man** (Robinson), 8.6-341.

8.6-104

612.5

Eliassen, Einar, **Temperaturforhold hos dyr og mennesker**. [Body temperature state in animals and in man.] *Naturen*, 77(4):105-116, 1953. 2 figs. **DLC**—A popular discussion of the chemical, physical and physiological factors determining the regulation of body temperature in cold blooded and warm blooded animals and in man. Also temperature regulation during hibernation is discussed briefly. *Subject Heading*: 1. **Body temperature**.—*I.L.D.*

8.6-105

551.586:612.275.1

Herrligkoffer, Karl M., **Der Mensch in grossen Höhen**. [Man at great heights.] *Naturwissenschaftliche Rundschau*, 10(2):56-59, Feb. 1957. **DWB**—The effects of decreased oxygen pressure above 3000 m on the blood and brain are described. Even at 7000 m in the Himalayas adaptation occurred, but at greater heights the body tries to save oxygen by avoiding physical work. Mountain sickness usually appears at 4000 m; at 7800 m man comes into the "death zone," the symptoms of which are described. Other problems are cold, decreased appetite, and alkalinity due to breathing out CO_2 . Effect of a drug (Pervitin) is described. *Subject Headings*: 1. **Altitude effects on man** 2. **Mountain sickness**.—*C.E.P.B.*

8.6-107

551.515.8:591.14

Lotmar, R. and Hafelin, J., **Über den Einfluss der Witterung auf den Schwefelstoffwechsel bei Kaninchen**. [On the influence of weather on the sulfur-exchange of rabbits.] *Naturwissenschaften*, 42(8):215-216, April 2, 1955. ref. **DWB**—Radioactive sodium sulfate was fed to rabbits for 4 months. Animals showed increased excretion of sulfur as follows: 70 front-free days and 3 occlusions—none; 13 warm fronts, only isolated animals; 14 weak cold fronts, more than 80% on 2 occasions, in both of which arctic air masses took part. Of 17 average or marked cold fronts, 12 which showed a real change of air mass were effective. The exchange involves other elements besides sulfur. *Subject Heading*: 1. **Bioclimatic research**.—*C.E.P.B.*

8.6-108

551.57:576.8

Miller, Paul R. and Clark, Francis E. (both, *Agri. Res. Serv., U. S. Agri. Dept.*), **Water and the micro-organisms**. *U. S. Dept. of Agriculture, Water: The Yearbook of Agriculture*. 1955:25-35, pub. 1955. fig. **DA, DWB**—The various ways in which moisture (rain, dew, humidity and soil moisture) affects growth and spread of microorganisms (both harmful and beneficial) are reviewed. Several specific plant diseases are mentioned in connection with the mechanism of their behavior with respect to moisture. Some spores are spread by raindrops or water, others multiply only when the soil is saturated, while still other microorganisms will propagate at soil-air relative humidities much below the 95% or 100% required for plant growth—in fact at any moisture content above the wilting point. A map of the U. S. shows how the cotton anthracnose is distributed east of a line representing the 10" or more isohyet for summer precipitation (from extreme E. Texas, east). Air currents, temperature, insects and animals are important factors, too. *Subject Headings*: 1. **Aerobiology** 2. **Moisture effects on microorganisms**.—*M.R.*

8.6-109

621.396:612

Schwan, H. P. and Li, K., **Hazards due to total body irradiation by radar**. *Institute of Radio Engineers, N. Y., Proceedings*, 44(11):1572-1581, Nov. 1956. 7 figs., 4 tables, 22 foot-refs. **DLC**—A thorough analysis is made of experimental data relating to the amount of air-borne radio frequency radiation that the body can tolerate. The eyes and testicles can be damaged by selective absorption of 0.1 or 0.01 watt/cm², respectively, for 10 cm wavelength. Skin, fat and deep tissue layers absorb and compensate for heat generated by varying wavelengths in varying ways. The best estimates are that for 500 mc radiation, deep heating occurs, with 30-40% absorption, and a critical flux of 0.03 watt/cm²; for 1000-3000 mc, absorption by skin, fat and other tissue is complete, so 0.01 watt/cm² is the tolerance limit; and for more than 3000 mc, and absorption of 40-50%, 0.02 watt/cm² can be stood. Curves

how results for a large number of frequencies, temperatures and types of tissue. *Subject Headings*: 1. Radio radiation damage to body tissues 2. High frequency radiation damage. —M.R.

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: Preparation of met. yearbooks, 8.6-10; Canadian Arctic (Jacobsen), 8.6-42; Upper atmos. rocket research (Boyd), 8.6-62; Climat. data for determining length of runways (Tardos), 8.6-70; Constant-level balloon trackings (Ohnsorg), 8.6 132; Radiosonde comparisons (Malet), 8.6-144; Aerological soundings (Malet), 8.6 145; Automatic recorders for solar radiation measurement (Kassander), 8.6 218; Temp. computation (Srinivasan), 8.6 238; International classification for snow, 8.6-305; Snow surveys, Gt. Brit., 8.6-306.

8.6-110

551.501(26):551.594.5:550.3:061.3

Polarlicht-Beobachtungen im Internationalen Geophysikalischen Jahr 1957 1958. [Auroral observations in the IGY 1957-58.] *Wetterlotse*, No. 113:41-48, 55-56, Feb. 1957. DLC—Aurora especially calls for observational collaboration of sailors during the IGY. Being a period of maximum sunspot activity, aurora can be expected occasionally in low latitudes during especially intensive solar outbreaks, and such observations are needed. Instructions for auroral observations at sea are given. *Subject Headings*: 1. Auroral observation program 2. Marine observation 3. International Geophysical Year program.—C.E.P.B.

8.6-111

551.501:551.508.79:551.579.5

Ravasz, Tibor, A talaj mintavételes vízforgalom-vizsgálata. [Investigation of soil moisture regime by sampling.] *Időjárás*, Budapest, 59(6):375-378, Nov./Dec. 1955. 2 figs., table. DLC, DWB—A soil sampler is described and illustrated, which makes it possible to obtain samples 5 cm deep, down to a depth of 100 cm. The method of sampling and moisture determination is discussed in detail. Sampling of the entire 1 m section by 5 cm portions is found to give a good indication of the moisture regime in the soil, while the conventional method of sampling at 5, 10, 20, 30, 50, 75 and 100 cm proved utterly inadequate. *Subject Headings*: 1. Soil moisture instruments 2. Soil moisture measurement.—G.T.

8.6-112

551.501:551.573:001

Robertson, G. W., Standardization of the measurement of evaporation as a climatic factor. *World Meteorological Organization*, [Pub.] No. 42, TP 16; *Technical Note*, No. 11, 1955. 10 p. 14 refs. French, Russian and Spanish summaries, preceding p. 1. DWB—"Latent evaporation" as distinguished from actual evaporation, or "potential evapotranspiration" is defined in terms of the "maximum possible evaporation that could be obtained from a wet, plain, horizontal black surface exposed to meteorological conditions of solar and sky energy, wind, temperature, and vapor pressure which exist in the vicinity of plant and animal habitat." The container should be small enough to have a minimum influence on its own microclimate. The importance of evaporation in different fields of endeavor, the meteorological factors affecting evaporation and the physical characteristics of containers, the types of evaporimeters in use and their deficiencies and the superiority of the Bellani plate atmometer, are discussed. *Subject Headings*: 1. Evaporimeters 2. Latent evaporation 3. Evaporation measurement 4. Definitions.—M.R.

8.6-113

551.501:551.591

Stewart, K. H., A simple method for measuring atmospheric attenuation of light ("meteorological optical range" or visibility) at night. *Great Britain. Meteorological Research Committee, M.R.P.*, 997, Aug. 14, 1956. 6 p. 3 figs., table, 3 refs., 3 eqs. Mimeo. DWB—An alternative to the Gold visibility meter is described, using two lights, one at a distance viewed directly, and the other carried on the observer's head and reflected in a small convex mirror on a stand. Observer varies his distance from the mirror until the two lights appear

equally bright; the ratio of the two distances gives visibility. Tried out at Kew Observatory it gave much smaller random errors and better agreement between different observers than the Gold meter. *Subject Heading: 1. Night visibility measurement.—C.E.P.B.*

8.6-114

551.501:551.571.4 551.508.51

Vorob'ev, I. E., *K metodike nabliudenii nad vlazhnost'iu i temperaturoi vozdukha na vysobogornyykh stantsiakh*. [Humidity and air temperature observations at high mountain stations.] *Leningrad. Glavnaia Geofizicheskaya Observatoriia, Trudy*, 34(96):69-76, 1952. fig., 5 tables. **DLC**—In order to improve the processes of observations and of the calculated data of atmospheric humidity at high altitude stations, a series of investigations were carried out in 1946 at the high altitude station Kazbek to determine: 1) the time interval between the moistening of the thermometer and the reading of the psychrometer in the instrument shelter and 2) the atmospheric humidity in the shelter by means of an aspirating psychrometer and hygrometer. The data on the moistening of the thermometer during negative temperatures and time of reading after moistening, error in the psychrometer readings in the instrument shelter for aspirating psychrometer and hygrometer and a comparison between the psychrometer in the shelter and the aspirating psychrometer and between the hygrometer and a hygrometer with constant moistening are presented. *Subject Headings: 1. Humidity measurement techniques 2. Psychrometers 3. Aspiration psychrometers 4. Hygrometers 5. Kazbek, U.S.S.R.—I.L.D.*

8.6-115

551.501.4:551.573:551.585.5

Budyko, M. I., *Klimaticheskie uslovia uvlazhneniia na materikakh. Soobshchenie II*. [Climatic conditions for determining the humidity of continents, Pt. 2.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr.*, No. 4:3-15, July/Aug. 1955. 4 figs., map (fold.), 12 refs., 6 eqs. **DLC**—The complex method of determining evaporation which takes into account simultaneously: radiational balance, temperature and atmospheric humidity is presented together with the appropriate formula and three methods for determining evaporation—on the basis of saturation deficit of the atmosphere, temperature summation and radiational balance—are evaluated. It is shown that radiational balance is the most useful magnitude for determining annual operation and a map showing the radiational index of aridity is constructed and reproduced. *Subject Headings: 1. Evaporation calculations 2. Aridity index.—I.L.D.*

8.6-116

551.501.4:551.571

Vilkner, Hans, *Die Auswertung von Registrierungen der Trocken- und Feuchtemperatur*. [Evaluation of records of dry and wet bulb temperature.] *Zeitschrift für Meteorologie*, 10(10):295-299, Oct. 1956. 3 figs., table, 10 refs. **DLC**—Nomograms are given for simple rapid evaluation of vapor pressure and relative humidity from autographic curves of dry bulb (in °C) and depression of wet bulb (in mm). *Subject Headings: 1. Psychrometer evaluation 2. Nomograms.—C.E.P.B.*

8.6-117

551.501.42:551.508.41

Saito, R., *On the homogeneity of observed values of pressure*. *Journal of Meteorological Research*, Tokyo, 7(8):472-483, Oct. 1955. 6 tables, 14 refs., 26 eqs. In Japanese; English summary p. 472. **DWB**—The inhomogeneities of observed values of atmospheric pressure caused by the change of method of observation were investigated. The results are summarized as follows: (1) Concerning temperature correction, values of expansion coefficient of brass and mercury in the formula of correction were changed about 1889. However, its effects upon the observed values of pressure are negligible. (2) In Japan, gravity values actually measured and those obtained by interpolating the actually measured values are used instead of the values calculated from the well-known empirical formula of gravity in the correction and reduction formulas of pressure since 1950. The inhomogeneities caused by this alteration are great in the Pacific coastal stations such as Nemuro, where the difference between the value of the former gravity correction and that of the later one amounts to 0.2 mm Hg. (3) Since 1950, the effect of water vapor are taken into consideration in the sea-level reduction formula. The difference between the former reduction value and the later one amounts to 0.2 mm Hg at

the stations which are situated over 300 m above the sea-level. *Subject Headings: 1. Barometer corrections 2. Japan.—Author's abstract.*

8.6-118

551.553:551.501.42:551.506(52)

Saito, R., *On the homogeneity of observed values of wind speed.* *Journal of Meteorological Research*, Tokyo, 7(12):770-778, Jan. 1956. 2 figs., 2 tables, 11 refs., eq. In Japanese; English summary p. 770. **DWB, DLC**—The lack of homogeneity of observed values of wind speed due to changes in the method of observation is investigated. In Japan the method of observation was subject to frequent alterations which divide the history of wind observation into seven periods. It is found that the homogeneity of wind data was destroyed to such an extent that continuous use of data for successive periods is practically impossible. Even the latest alteration in 1949 by introduction of wind-tunnel formulas, does not permit connection of the earlier data with the later. *Subject Headings: 1. Reduction methods 2. Wind observation 3. Japan.—From author's abstract.*

8.6-119

551.501.45:551.577(914)

Estoque, Mariano A., *Analysis of rainfall in Manila, Pt. 1-2.* *Philippines. Weather Bureau, The Elements*, 3(1):5-8, Jan. 1952; 3(2):5-8, Feb. 1952. **DWB**—Monthly rainfall amounts for Manila for the period May-Oct. 1948-1950 are presented in an arrangement showing their origin in (1) intertropical convergence, (2) cyclonic storms and (3) minor disturbances. A comparison of the occurrence and nonoccurrence of rain for the same 24-hr period at Marsman Office and at International Airport shows a discrepancy of 20%. *Subject Headings: 1. Rainfall analysis 2. Manila, Philippine Islands. G.T.*

8.6-120

551.501.45:519.241.6:551.577.3

Katsnelson, J. and Kotz, S., *On the upper limits of some measures of variability.* *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 8(1):103-107, 1957. 3 refs., 4 eqs. English, German and French summaries p. 103-104. **DWB**—Relative variability V_r =ratio of mean deviation of n terms to mean, has a possible maximum of 2. Observed maxima: annual rainfalls, .94 at Themed, Sinai; monthly, 1.93 at Beer-sheba for Sept. Coefficient of variability V_c =ratio of standard deviation to arithmetic mean. Theoretical maximum $\sqrt{n-1}$; 5.39 at Beer-sheba (30 Septembers). Intersequential variability V_s =ratio of average absolute differences of successive terms to arithmetic mean. Maximum $2n/(n-1)$; Themed 26 years gave 1.31 compared with possible 2.08. *Subject Headings: 1. Variability coefficients 2. Rainfall variability.—C.E.P.B.*

8.6-121

551.501.45:551.511:551.551

Tank, William G., *The use of large-scale parameters in lower level diffusion computations.* *American Meteorological Society, Bulletin*, 38(1, Pt. 1):6-12, Jan. 1957. 7 figs., 2 tables, 4 refs., 17 eqs. Also issued as *U. S. Dugway Proving Ground. Cloud Physics Branch, Scientific Report*, No. 4, March 6, 1956. 38 p. 3 figs., 9 foot-refs., 41 eqs. **DWB**—A method is set forth whereby gaseous diffusion in the low levels of the atmosphere can be calculated by Roberts' diffusion equation (modified to consider instantaneous volume sources) using only large scale synoptic parameters that are readily obtainable from the surface analysis and pibal reports. The three pertinent meteorological parameters utilized are: 1) the mean surface wind, 2) the angle between the surface wind vector and the surface isobars, 3) the height of the gradient level. Theoretical and observed dosage values are compared by means of dosage isopleth diagrams. Results show that the method yields quite satisfactory results, with regard to both dosage magnitude and distribution. The assumptions necessary for the application of the method, and their relative importance, are mentioned. The limitations of the method are also discussed. *Subject Heading: 1. Atmospheric diffusion calculation.—Author's abstract.*

8.6-122

551.501.6:551.577.32(44:234.3)

Balseinte, R., *Un point de méthodologie climatique: essai d'une représentation graphique complète de la pluviosité.* [An item of climatic methodology: an attempt to a complete graphical presentation of rainfall.] *Revue de Géographie Alpine*, Grenoble, 42(1):171-175,

1954. fig. DLC A method for presenting mean rainfall as a function of intensity, frequency and amount on a graph is described. It consists of representing rainfall by a rectangle the area of which is equal to amount and the sides to frequency and intensity. The mean seasonal rainfall is represented. The construction of this polygon of seasonal rainfall and its application to particular stations in the French Alps is illustrated. *Subject Headings:* 1. Annual rainfall diagrams 2. French Alps.—*I.L.D.*

8.6-123

551.501.6:551.571

Belinskii, V. A., *Prosteishaia nomogramma dlia psikhrometricheskikh vychislenii* [A very simple nomogram for psychrometric calculations.] *Meteorologiya i Gidrologiya*, No. 5:32-35, May 1956. fig., 2 tables. DWB, DLC —The psychrometric formula is discussed with special reference to the problem of determination of water vapor pressures and a radiational nomogram for determining vapor pressure and examples of its use are presented. *Subject Headings:* 1. Nomograms 2. Vapor pressure calculations.—*I.L.D.*

8.6-124

551.501.6:551.557.2

Sherman, Leon, The use of "non-fluence" lines in streamline analysis. *American Geophysical Union, Transactions*, 37(5):549-552, Oct. 1956. 2 figs., 8 refs. DWB, DLC —Greater accuracy will be attained in streamline analysis if the streamlines are initially drawn in segments each in the direction toward narrower streamline spacing. Lines which divide the map into regions of confluence and diffluence, "non-fluence" lines, provide both the starting and terminal points for such streamline segments. Such non-fluence lines are the loci of points of orthogonality of rulings (streamlines) and isogons; they are the inflection lines of the set of orthogonal streamlines. In addition to this aid in the more accurate construction of streamlines, they prove useful in the interpretation of streamline maps and in theoretical considerations. *Subject Heading:* 1. Streamline analysis. *Author's abstract.*

8.6-125

551.501.6:518.3:551.547.2

Valkó, Péter, *Tengerszinti redukció grafikus módszerrel*. [Graphical method of reduction to sea level.] *Időjárás*, Budapest, 59(2):97-101, March/April 1955. 4 figs., table, eqs. DWB —In practical synoptic meteorology pressure is reduced to sea level values by using the formula $D = \beta(P/T)h'$. By introducing the auxiliary variable ξ the above formula is divided into two equations having three variables each: $DT = \xi$ and $\xi = \beta.P.h'$. By representing the first equation in a diagram and the second in a nomogram and by combining these two figures we obtain a composite nomogram for determining reduction values. *Subject Headings:* 1. Nomograms 2. Pressure reduction.—*Trans. of author's abstract.*

OBSERVATIONAL DATA

See also: Flood control in Asia (United Nations. Econ. Commiss. for Asia and Far East), 8.6-6; Preparation of met. yearbooks, 8.6 10; Met. data for S. oceans (Venter), 8.6-80; Wind speed (Saito), 8.6-118; Airplane observations of cirrus clouds (James), 8.6-287; Airplane observations of cloud top heights (Pramanik, Koteswaram), 8.6-290; Rain-fall data (Ramakrishnan, Naraynan), 8.6-291.

8.6-126

551.506.1(665)

Gambia. [Meteorological Service], *Meteorological observations, 1910(?)*—Latest issue seen, 1948. Excerpted from *Annual Report of the Colonial Government* (see also 3H-128, Aug. 1952. MAB). Observations for Bathurst first pub. 1926. DWB (broken, 1910-1946) MH-BH (broken, 1910-1948). GB-MO (also has *Climatic returns, 1939-1944*)—Following abstract is on 1947 issue (4 sheets, entirely tables), at Bathurst and Yundum.—Monthly and annual mean daily (and 9 h and 15 h) data for pressure, temperature, vapor pressure, relative humidity, cloud, rainfall, weather and wind direction for Bathurst (13°28'N, 16°34'W, 8 ft elev.) and Yundum Airport (13°21'N, 16°40'W, 86 ft elev.). *Subject Headings:* 1. Annual meteorological data summaries 2. Observational data 3. Gambia.—*M.R.*

8.6-127

551.506.1(058)(437)

*Lomnický, Štít, Czechoslovakia. *Observatoria, Rocenka poveternostných pozorování*, 1950, 1951, 1952, 1954. [Yearbook of meteorological observations, 1950, 1951, 1952 and

1954.] *Czechoslovakia. Statni Meteorologický Ustav V. Praze, Publikacia, Ser. D, Vol. 5, 6, and 7, all publ. 1954; Vol. 9, pub. 1956.* 4 pieces, about 75 p. each. almost entirely tables. T-p. and introduction in Czech, Russian and French. Legends in Czech and French. **DLC**—The yearbooks for 1950, 1951 and 1952 continue the tabulations of data for this mountain station (2635 m) in much the same form as the 1947-49 annuals (see 4.5 39, May 1953, *MAB*, for 1947-48 issues). The basic data are thrice daily values of pressure, temperature, vapor pressure, relative humidity, cloud (0-10) visibility, wind, amount of hoar frost (in kg/m²), daily precipitation and miscellaneous phenomena. In sections III to VI the hourly temperature, relative humidity, sunshine, and wind direction and speed and wind direction and speed frequencies, mean hourly wind speed and maximum hourly wind speed are presented. Ten-year averages of temperature, precipitation, sunshine and rime amount are given for each month in the 1952 yearbook along with a comparison of precipitation, caught by 3 types of gages. *Subject Headings:* 1. Annual meteorological data summaries 2. Rime observations 3. Czechoslovakia.—*M.R.*

8.6-128

551.506.1 (569.4)

*Israel. Meteorological Service, *Annual Weather Report, 1952, 1953, 1954.* Its *Series B*, No. 55/W, 1953; No. 68/W, 1954; No. 81/W, 1955. 3 pieces. figs., map, tables. In Hebrew and English. **DWB, DLC**—These annual summaries follows the general pattern of those for 1948-50 (see 4.9-37, Sept. 1953, *MAB*), only somewhat expanded. The 1954 report gives a summary of temperature and rainfall anomalies for the year, a summary of weather conditions for each month, annual means and extremes of the usual climatic elements and anomalies, frequencies of wind direction for 20 stations, mean pressure at 4 stations, evaporation and other data for Lod Airport Evaporation Station for each month, annual Piché and pan evaporation at 15 stations, departures of monthly and annual temperatures and relative humidity for 1940-49, graphs of monthly temperature, precipitation and relative humidity for six stations, a map of Israel showing stations and an index of stations. *Subject Headings:* 1. Annual meteorological data summaries 2. Evaporation data 3. Israel.—*M.R.*

8.6-129

551.506.5 (99)

*Boujon, Henry, *Les observations météorologiques de Port-Martin en Terre-Adélie 66°49'04"S—141°23'39"E—altitude 14 m, Fasc. 1, Conditions atmosphériques en surface et en altitude de 14 février 1950 au 14 janvier 1951: relevés quotidiens et commentaires.* [Meteorological observations at Port-Martin in Adélie Land, Pt. 1, Atmospheric conditions at the surface and aloft, Feb. 14, 1950-Jan. 14, 1951: daily observations and commentaries.] *Expéditions Polaires Françaises, Expéditions Antarctiques, Résultats Scientifiques, Ser. S.V. (Météorologie), [Unnumbered report], Paris, 1954.* 167 p. 30 figs. (incl. photos), forms, numerous tables. **DWB**—Data tables present actual 3-hourly surface observations and once daily upper air winds at standard levels to 12 km, description and illustration of station, surroundings and equipment, clouds, auroras, different phenomena, recorder records of unusual pressure, temperature and wind situations, statistical, climatic summaries (wind, temperature, pressure, blowing snow, clouds, visibility and winds aloft) at Port-Martin in Adélie Land. *Subject Headings:* 1. Expeditionary data 2. Upper air wind data 3. Expéditions Polaires Françaises 4. Adélie Land, Antarctica.—*M.R.*

8.6-130

551.506.7:551.555.1 (729.7)

Charnock, H.; Francis, J. R. D. and Sheppard, P. A., *An investigation of wind structure in the Trades: Anegada 1953.* *Royal Society of London, Philosophical Transactions, Ser. A*, 249(963):179-234, Oct. 18, 1956. 23 figs., 15 tables, 22 refs., eqs. **DWB**—Two-theodolite pilot balloon ascents (466) were made on 15 days, March 12-April 7 to 1500 m from the small flat island of Anegada (18°N, 64°W). The pressure field was determined from neighboring islands. After a discussion of the theoretical background the observations are described. The mean surface wind (0-50 m) was 0.25-1.45 (mean 0.53) times the geostrophic wind and deviated from it by -11 to +80½° (mean 33°). It was 1.16 times anemometer wind (7 m). Vertical profiles of components along (U) and normal to (V) the mean surface wind show a marked maximum in U at 350 m; V increases up to 900 m, constant above. Observations at nearby islands show that the horizontal velocity gradients are small. Shearing stress

changes from 0.41 dyn/cm^2 at the surface to -0.37 at 1300 m along wind direction, small across wind. Surface stress was calculated as 1.5×10^{-3} . Eddy viscosity increases up to 100 m, then constant about $10^6 \text{ cm}^2/\text{s}$. Mean profiles of U and V are shown for each day; the height of maximum U varies from 125–1400 m; profile of V varies but is usually increasingly negative with height. Fluctuations of wind are next discussed. The effect of averaging is discussed. Covariances of gust components are calculated; the ratio of U to V components varies from 1.7 at 500 m to 0.87 at 1325 m, ratio of vertical to V components from 0.17 at 475 m to 0.05 at 1325 m. Momentum transport is calculated as a function of height and wind shear. An appendix (p. 223–233) discusses the effect of the island (30 km^2) on the oceanic Trades. Mean vertical profiles of vertical velocity are constructed; the mean is 10–20 cm/s with a maximum near the surface. The effect on horizontal motion was examined by comparing ascents on windward and leeward sides and from a boat. They showed convergence on the SE end of the island up to 300–500 m, and divergence above, further downwind. *Subject Headings*: 1. Trade wind structure 2. Anegada, West Indies.—C.E.P.B.

8.6-131

551.506.7(536.5)

*Great Britain. Meteorological Office, Upper air data for stations maintained by the Meteorological Office. Summaries of radio-sonde observations of temperature and humidity and of radar wind measurements at standard pressure levels, 1947–1950, Pt. 7, Bahrain. London, 1955. 36 p. 5 tables, 5 plates. Its *M.O.* 555, Pt. 7. DWB—Other parts previously published are Pt. 1, Larkhill (see 4.3–45, March 1953, *MAB*), Pt. 2, Lerwick, Pt. 3, Habbaniya, Iraq, Pt. 4, Malta (see 5D–209, April 1954), Pt. 5, Aden (see 6.4–33, April 1955), and Pt. 6, Nicosia (see 6.8–88, Aug. 1955). Data used in this, the 7th of a standard series of upper air summaries for British aerological stations both in the United Kingdom and abroad, comprise the period July 1947–Dec. 1950. Temperature and height of standard pressure levels from surface to 40 mb, relative humidity and mixing ratio for levels from surface to 300 mb, wind direction and speed at standard pressure levels are given in frequency tables and graphs; Baillie wind roses, etc., tropopause pressure and temperature, standard deviation of temperature, and standard vector deviation of wind for each month are also shown graphically. *Subject Headings*: 1. Upper air data 2. Bahrein Islands.—M.R.

INSTRUMENT CARRIERS

See also: Conquest of the upper air (Vaeth), 8.6-12; Upper atmos. rocket research (Boyd), 8.6-62; Earth satellites (Kelly), 8.6-63; Artificial earth satellite (Singer), 8.6-64; Atmos. phenomena at high altitudes (Mich. Univ. Engr. Res. Inst.), 8.6-175.

8.6-132

551.501.7:551.557:551.507.3

Ohnsorg, F., Error estimates for constant-level balloon tracking. *Journal of Meteorology*, 14(1):81–83, Feb. 1957. table, eqs. DWB—A method is described of estimating errors on the basis of the trajectory data themselves by measuring velocities over intervals t and $2t$ or $3t$, where t is the smallest available time interval between fixes. Procedure for determining usefulness of a given trajectory for a particular problem is outlined. *Subject Headings*: 1. Constant level balloon tracking errors 2. Upper air wind observation.—C.E.P.B.

8.6-133

551.507.321 629.132.1

Ballooning. Institute of Navigation, London, *Journal*, 10(1):63–77, Jan. 1957. Contents: Gibbs-Smith, C. H., Notes on the history of ballooning, p. 63–67, 4 figs. Harrison, D. N., The use of balloons in meteorology, p. 67–70. Durst, C. S., Constant-level ballooning, p. 70–74, 2 figs., 6 refs. Discussion, p. 74–77. DWB—C. H. GIBBS-SMITH describes invention of hot-air and hydrogen balloons, both in 1783, and subsequent developments, including dirigible airships in 1884. D. N. HARRISON gives history of meteorological ballooning since 1784, registering balloons (1893), pilot balloons (1909) and radiosondes. The height limit of balloons is calculated as 37 km. C. S. DURST describes methods of obtaining constant-level flight; Japanese fire-balloon trajectories and constant level balloons over America and N. Atlantic are shown. *Subject Headings*: 1. Balloons 2. Constant level balloons.—C.E.P.B.

8.6-134

551.507.362:551.508.85

Jackson, Howard J. and Smith, Harold D., **Nose cone antenna for the aerobee rocket.** New Mexico. College of Agriculture and Mechanic Arts. Physical Science Laboratory, Contract AF 19(604)-409, Scientific Report No. 4, May 15, 1956. 16 p. 10 figs. (incl. photos), 2 refs.—The Aerobee Nose Cone Antenna has a measured VSWR of less than 2:1 over a frequency range of 450 to over 780 Mc/sec. The antenna pattern in the x - y plane is nearly omnidirectional. The nulls are very broad and are no more than 10 db down, relative to the maximum radiated power. The pattern in the x - z plane has two main lobes. The z -axis of the coordinate system coincides with the missile longitudinal axis. The angle between these lobes, measured from the center of each lobe, is approximately 38° . The half-power beam widths of the lobes are approximately 18° . The amplitude of the secondary lobes are below 5 db, relative to the peaks of the main lobes. The cross component of the radiation pattern in the x - y plane is greater than 32 db below the main lobe peak. *Subject Heading: Aerobee rocket radio instrumentation.—Authors' abstract.*

INSTRUMENTS

See also: **TB-52 bathythermographs** (Sabinin, Zalogin), 8.6-76; **Soil moisture sampling** (Ravasz), 8.6-111; **Humidity obs. in high mts.** (Vorob'ev), 8.6-114; **Pressure** (Saito), 8.6-117; **Nose cone antenna for aerobee rocket** (Jackson, Smith), 8.6-134; **Radiosonde infrared radiation measurement** (Gergen), 8.6-226; **Radiosonde cosmic ray observation** (Noon et al.), 8.6-229; **Lightning damage to anemometers** (Coleman), 8.6-362; **Atmospheric electrical measurement** (Schaefer), 8.6-364.

8.6-135

551.508:536.53

Albrecht, Hans J., **Direct-coupled thermocouple amplifiers for measurement in geophysics and meteorology.** *Geofisica Pura e Applicata*, Milan, 34:196-206, 1956. 2 figs., 9 refs., 198 qs. English and German summaries, p. 196. **DLC**—Following a brief discussion of known methods of electronic amplification, this paper describes new thermocouple amplifiers using junction-type transistors, and their theoretical and practical design. The apparatus amplifies thermocouple voltage or other input signals of any impedance such that an ordinary pointer-type galvanometer or recorder can be used as indicator. The problem of temperature compensation has also been dealt with. Details of two transistor amplifiers are given as examples. In conclusion geophysical applications are mentioned. *Subject Heading: 1. Thermocouple amplifiers.—Author's abstract.*

8.6-136

551.508:681.2(47)

Korzun, V. I., **Razvivat' i uluchshat' gidrometeorologicheskoe priborostroenie.** [To develop and improve hydrometeorological instrument production.] *Meteorologiya i Gidrologiya*, Leningrad, No. 6:3-6, Nov./Dec. 1955. **DWB, DLC**—The meteorological instrument production program of the plants of the Hydrometeorological Service of the U.S.S.R. in 1955 was to produce 134 different types of instruments and equipment. This includes 190,000 radiosondes (83,000 in 1950), 28,000 aneroid barometers (14,000 in 1950) and 25,000 automatic recorders of pressure, temperature and atmospheric humidity (6,100 in 1950). A survey of the meteorological instrument industry of the U.S.S.R. is presented. *Subject Headings: 1. Meteorological instrument industry 2. U.S.S.R.—I.L.D.*

8.6-137

551.508.21 53.089.6

Hinzpeter, Hans, **Über Eichungen mit dem Silverdiskaktinometer bei nichtkonstanter Strahlung.** [Calibration of a silver disk actinometer in nonconstant radiation.] *Zeitschrift für Meteorologie*, 10(10):300-302, Oct. 1956. 4 refs., eqs. **DLC**—It is shown that in comparisons of the silver disk actinometer during variations of solar radiation over level ground errors of 0.5% may arise from the great heat content of the receiver. *Subject Heading: Actinometer errors.—C.E.P.B.*

8.6-138

551.508.21:551.521.63

Sekihara, K. and Kawamura, K. (both, *Met. Research Inst., Tokyo*), **An integrating actinometer for ultraviolet radiation.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2,

33(4):164-168, Sept. 1955. 7 figs., table, 3 refs. In Japanese; English summary p. 164. **DWB, DLC**—An integrating actinometer for ultraviolet radiation with a photo-tube and a filter was constructed which is operated by a 100 V A.C. power supply. The principle of operation is charging up the photo-electric current due to incident radiant energy in a condenser and then discharging and forming an impulse to operate a relay counter. Experiments on the linearity of the response, errors due to power supply fluctuations, temperature effects of the instrument and the absolute sensitivity were carried out. The general performance has been very satisfactory. Above all, the stability against the fluctuations of power supply is the essential merit of this instrument. Using these instruments ultraviolet solar and sky radiation falling on a horizontal plane were measured in two different ranges of wave-length, the one about 3700 Å and the other about 3400 Å. The observed results are compared with those of Robitzsch pyrheliometer. According to this result, the extinction of ultraviolet solar and sky radiation due to cloudy weather is stronger in the shorter range of wave-length than in the longer, and moreover, the extinction of total, that is, including visible and infrared radiation is by far the strongest, naturally because of the strong absorption of infrared radiation due to water vapor. *Subject Heading: 1. Ultraviolet actinometers.—Authors' abstract.*

8.6-139

551.508.25:551.521.6/7

Lundby, Arne, Use of scintillation detectors for measuring ultra-short time intervals. *Archiv for Matematik og Naturvidenskab*, Oslo, 51(6):91-116, 1952. 20 figs., 7 refs., 6 eqs. **DLC**—Radiations from various sources (cosmic or nuclear) can best be measured by using anthracene scintillation crystals which emit light that directly sensitizes a cathode ray tube photo multiplier with a delayed coincidence circuit having a resolving time of about 10^{-9} second. The pulse shapes vary, but by observing the fluctuations in the rise time due to single electrons released by the cathode tube, time intervals of 10^{-9} to 10^{-10} sec can be measured. *Subject Headings: 1. Scintillation detectors 2. Ultra-short time measurements.—M.R.*

8.6-140

551.508.25

Tabor, H. and Steinberger, I. T., An instrument for measuring absorptivities for solar radiation. *Journal of Scientific Instruments*, 33(9):356-358, Sept. 1956. 2 figs., 4 refs. **DLC**—Solar radiation falls (through glass) alternately on 2 sides of a metal plate (6×6 cm $\times$ 2 mm), coated on one side with the substance whose absorptivity is to be measured, and on the other side with lampblack. The ratio of the absorbed heat quantities is found by the times taken to rise and fall through a certain temperature cycle. *Subject Heading: 1. Solar radiation absorption instruments.—C.E.P.B.*

8.6-141

551.508.26:551.54

Yajima, Y., Pressure effect on thermometers, Pt. 1. *Journal of Meteorological Research*, Tokyo, 6(1/3):21-30, March 1954. 7 figs., 4 tables, 2 refs., numerous eqs. In Japanese; English summary p. 21. Also: Pt. 2, *Ibid.*, 7(12):790-793, Jan. 1956. 2 figs., table, refs. In Japanese; English summary p. 790. **DWB, DLC**—Empirical formulas are developed, expressing the magnitude of the pressure effect on temperature readings with thermometers having bulbs of different shapes. *Subject Headings: 1. Thermometers 2. Pressure effect on thermometers.—G.T.*

8.6-142

551.508.822:551.571.7

Hooper, A. H., Heterogeneity in the measurements of humidity made by the radio-sonde network of Europe. *Meteorological Magazine*, London, 86(1015):13-21, Jan. 1957. 5 figs., table, 5 refs. **DWB**—In an investigation of radio refractive index, discrepancies were found in radiosonde humidities over Europe. These are plotted and found to be most frequent over Holland. They are attributed to instrumental difficulties. J. VAN MIEGHEM agrees that data from Uccle are faulty, due probably to too great an ascensional velocity and possibly to errors in pre-launching preparation of the hygrometer. *Subject Heading: 1. Radiosonde humidity errors.—C.E.P.B.*

8.6-143

551.508.822:681.088

Langlo, K., Second world comparison of radiosondes. *World Meteorological Organization, WMO Bulletin*, 5(1):17, Jan. 1956. **DWB**—Session held at Payerne, Switzerland on Nov.

14-18, 1955, where arrangements were made for 13 different types of radiosondes to be compared at the coming second world comparison of radiosondes to begin May 23, 1956 at the same place where the first comparisons were made in 1950. High level (20-30 km.) accuracy is especially to be considered, for the benefit of the coming International Geophysical Year in 1957-58. J. LUGEON made all the arrangements for the meetings. *Subject Headings: 1. Radiosonde comparison sessions 2. Payerne, Switzerland.—M.R.*

8.6-144

551.508.822:551.501.7

§*Malet, L. M., *Comparaison régionale des radiosondes*, Bruxelles, 4-XI-54—19-XI-54, Tome 1, *Données relatives aux niveaux standards et aux niveaux significatifs des sondages P.T.U.* [Regional comparison of radiosondes, Brussels, Nov. 4-19, 1954, V. 1, Data relative to the standard and significant levels of the P.T.U. soundings.] Belgium. *Institut Royal Météorologique, Publications, Ser. A*, No. 3, 1955. 95 p. In French and English. figs., numerous tables. **DLC**—Following a WMO recommendation (Toronto 1953), the Royal Meteorological Institute of Belgium undertook a series of comparative radiosonde measurements (Brussels, Nov. 4-19, 1954) with the active participation of Germany, the U. S. and the Netherlands. The radiosondes compared were: the German GRAW II-50, the Dutch K.N.M.I.-Philips, the American AN/AMT-4 and BENDIX 403 MC/SEC, and the British KEW MK II. Technical details of each radiosonde (as well as the American AN/AMT-3 dropsonde) are given. Synoptic charts are presented for each day of the experiment. Pressure, temperature, humidity and height values measured at various levels during each ascent are tabulated and the values obtained at the 850, 500, 300, 100, 80 and 60 mb levels are shown in comparative tables. Supplementary data obtained by airplane and dropsonde are also given. A test of the graphical method of height computation (Väisälä method) shows that the mean personal error in the use of this method is subject to a standard deviation of 17 gpm. *Subject Headings: 1. Radiosonde comparisons 2. International radiosonde comparison.—G.T.*

8.6-145

551.508.822:551.501.7

Malet, L. M., *Technique et problèmes de sondages aérologiques*. [Methods and problems in aerological sounding.] *Ciel et Terre*, Uccle, 70(1/2):24-39, Jan./Feb. 1954. **DLC**—The evolution of the radiosonde and present day aerological networks; the basic principles of the various types of radiosonde (French, Swiss, Canadian, Finnish, English, U. S., German [Graw]), the calibration, homogeneity of network, comparison of radiosondes (Payerne, Switzerland, and in Oklahoma); causes of errors; studies to determine magnitude of and to eliminate errors (Finland, France and U. S.); and other aspects of international radiosonde technique are discussed in this comprehensive, non-technical article. *Subject Headings: 1. Radiosondes 2. Radiosonde comparisons 3. Radiosonde networks.—M.R.*

8.6-146

551.508.822

U. S. Air Weather Service, *Accuracies of radiosonde data*. Its *Technical Report*, No. 105-133, Sept. 1955. 12 p. fig., 12 tables, 9 refs. **DWB**—Statistical methods used in determining accuracy of radiosonde reports are described and illustrated. Sources of error in temperature measurements and the maximum and S.D. of errors, results of tests by New York Univ., by the U. S. Gov't. Meteorological Services at Oklahoma City, by the Signal Corps, etc., indicate that combined errors are usually less than $\pm 1.0^{\circ}\text{C}$ up to 50-60 thousand feet (S.D.'s of errors range from ± 0.65 to $\pm 1.5^{\circ}\text{C}$), and accuracy of differences in temperature between levels is even greater and well within the $\pm 1^{\circ}\text{C}$ limit. Pressure errors due to 6 causes are tabulated for 3σ and σ for $< 50,000$ ft and $> 50,000$ ft and are found to be ± 2.12 mb, and ± 1.06 mb for the respective ranges, or well within the tolerance desired. S.D. of humidity is $\pm 5\%$ but after passing through clouds or rain, or $< -40^{\circ}\text{C}$ temperature the values are less accurate. Height errors resulted from above errors are analyzed also showing a maximum expected error of ± 140 at 500 mb and 250 at 300. *Subject Headings: 1. Radiosonde accuracy evaluation 2. Radiosonde errors.—M.R.*

8.6-147

551.508.822

Venkiteshwaran, S. P.; Mani, Anna and Huddar, B. B. (all, *Met. Office, Poona*), A simple arrangement for seasoning aneroids and bimetals used in radio-meteorographs. *Indian Journal of Meteorology and Geophysics*, 7(3):316-317, July 1956. 2 figs. **DWB**—An auto-

matic circuit breaker (mercury switch) is installed in the calibration equipment for testing aneroid capsules (while "seasoning" them) in such a manner that the exhaust pump goes on at about 1000 mb, and off at 50 mb with an air "leak valve" going on and allowing air to leak into the chamber until pressure is back up to sea level value when the process reverses itself automatically and even for as many cycles as desired. The same principle (circuits shown in diagram) can be used for seasoning the bimetal temperature elements—the refrigerator (cold chamber) replacing the pressure chamber and pump, and a heater used in place of the leak valve, and the bimetal element replacing the aneroid capsule. *Subject Headings: 1. Aneroid capsule testing equipment 2. Radiosonde element seasoning.*—M.R.

8.6-148

551.508.822

Yacob, A. (*Met. Off., Poona*), **A modified scheme of contacts for the F-type radiosonde.** *Indian Journal of Meteorology and Geophysics*, 7(3):317-318, July 1956. 2 figs., ref. DWB—By rearranging the fixed contacts on the helix of the F-type radiosonde commutator, and the direction of impulse counting for pressure, dry bulb and wet bulb temperature, it is possible to make the records more sensitive to small changes of pressure and temperature and humidity. A pressure interval of 2 mb instead of 3 mb, and a temperature interval of 0.25°C instead of 0.4°C (as on the present arrangement) can be attained for each contact or impulse. *Subject Headings: 1. Radiosonde commutators 2. F-type (Indian) radiosonde.*—M.R.

8.6-149

551.508.92:662.613.5

Jason, A. C., **A recording smokemeter.** *Instrument Practice*, London, 10(2):133-134, Feb. 1956. 3 figs., 3 eqs. DLC—Smoke is measured in terms of optical density per unit length. Light which passes through the smoke is also absorbed by an annular optical wedge, the position of which is adjusted automatically as smoke varies by a servo-motor which is also coupled to a pen arm. *Subject Headings: 1. Smokemeters 2. Visibility meters.*—C.E.P.B.

SYNOPTIC ANALYSIS AND FORECASTING

See also: Weather map (Gt. Brit. Met. Off.), 8.6-16; Cline. Expert on hurricanes (Hogan), 8.6-53; Fetch and wave generation (Saville), 8.6-79; Microseismic storm detection (Savarenskii et al.), 8.6-208; Barometric tendency and weather change, Singapore (Sharp), 8.6-245; Cold wave forecasting (Kujirai), 8.6-256; Plotting vectorial changes of upper air winds as an aid to pressure forecasting (Roy, Rai Sircar), 8.6-266; Water level forecasting (Chizhov), 8.6-312; special bibliography on Numerical Forecasting (1954-1957), p. 804.

8.6-150

551.509:551.58

Heyer, E., **Bemerkungen über Klimatologie und Meteorologie.** [Remarks on climatology and meteorology.] Germany. *Deutscher Wetterdienst in der US-Zone, Berichte*, No. 42:92-93, 1952. DWB—Climatology and meteorology were formerly separate studies but now each is taking over some of the methods of the other, to the advantage of both. *Subject Headings: 1. Climatology 2. Synoptic meteorology.*—C.E.P.B.

8.6-151

551.509.1:621.396

Förchtgott, Jiří, **Rozhlasová zpráva o počasí.** [The radio's weather reports.] *Meteorologické Zprávy*, Prague, 9(2):48-52, 1956. 7 figs. DWB—For several years the Czechoslovak radio network has been broadcasting weather reports in the morning, known as "report for gliders." The synoptic and aerological data used, the evaluation of the weather situation and tendency, and the application of the weather reports to actual glider flight planning are discussed in detail and illustrated by an actual example with charts, aerological diagrams and a sample report sheet. *Subject Heading: 1. Weather broadcasting.*—G.T.

8.6-152

551.509.1:621.397

Kersten, W., **Die Bildfunk-Wetterkarte an Bord.** [The facsimile weather chart on board.] *Wetterlotse*, Hamburg, No. 112:33-37, Feb. 1957. fig. DLC—An example is

given of a forecast chart broadcast by Deutscher Wetterdienst, Analysenzentrale, Frankfurt a.M. in facsimile, and received on the fishery information ship "Anton Dohrn." *Subject Heading: 1. Facsimile map transmission.—C.E.P.B.*

8.6-153

551.509.1

Rodewald, M., *Die Symbole für Wind, Bewölkung und Wetter*. [Symbols for wind cloud and weather.] *Wetterlotse*, Hamburg, No. 111:1-9, Jan. 1957. 3 figs. DLC—Weather symbols or pictograms, besides their manifold advantages, have some disadvantages; they are slow to draw and have no alphabetical equivalents. Meteorologists were soon driven to a shorthand of figures. Weather symbols and numbers are set out in tabular form, also wind symbols including a solid triangle to represent 5 double barbs (force 10). Finally, fronts and weather are discussed. *Subject Heading: 1. Meteorological symbols.—C.E.P.B.*

8.6-154

551.509.1:621.397

U. S. Air Weather Service, and U. S. Air Photographic and Charting Service, *Weather-
vision using industrial television*. An analysis of the use of industrial-type television equip-
ment to provide weather service to out-of-station users. April 1954. 18 p.+other sections
repacked. figs., photos. On cover-page: *Demonstration Report: Weathervision using in-
dustrial television*. DWB—Five methods of briefing of Air Force pilots are enumerated:
1) face-to-face in weather analysis center or room, 2) face-to-face in briefing room away from
chart room, 3) by printer or facsimile transmission, 4) by squawk-box, telephone or voice
radio, and 5) weathervision or television. Several systems were tried and weathervision was
found economically feasible and more advantageous than other methods when it would replace
3 or more weather stations. Costs range from \$77.5 to \$69.5 thousand for equipment and
\$17.5 to \$48.0 thousand for yearly maintenance. Details are given in great profusion. Both
commercial and industrial television equipment were tried out at Hamilton Air Force Base,
and Stewart Air Force Base. *Subject Headings: 1. Weathervision 2. Television pilot briefing
equipment.—M.R.*

8.6-155

551.509.1:621.394

Wüsthoff, Paul, *Moderne Bildübertragungsverfahren für Wetterkarten*. [Modern
facsimile procedure for weather maps.] *Germany. Deutscher Wetterdienst, Mitteilungen*,
No. 10:110-118, Feb. 1955. 5 figs., 3 tables, 5 refs. DWB—The construction and operation
of the "Hellfax" facsimile equipment are described and discussed. The sender issues am-
plitude modulated picture impulses which are picked up by the receiver and mechanically
recorded. The transmission can be made by wire or radio channels. Figures and tables
showing the principal technical data of the German instrument and of the "Mufax" (England
and Canada) and the "Timefax" (America) facsimile equipment are presented for comparison.
It is pointed out that the English and American equipment require specially prepared paper
for the photo recordings but the German apparatus makes recordings on any paper, even on
pre-printed weather maps. The results on the first tests between Frankfurt and Hamburg
and Kiel, which were satisfactory, are discussed. The radio relay was frequency modulated
because frequency modulations are less sensitive to disturbances than are amplitude modula-
tions. A table showing the calling signals, locations of facsimile senders, the analysis-area-
limits and the radio frequencies from 12 regions in the Northern Hemisphere in kc. is included.
Almost all actual facsimile emissions are in the short-wave range. But the German weather
service plans to use the long wave emission on 106.7 kc. in its further tests. The transmission
of weather charts by facsimile is from 40 to 60% quicker, the number of transmitted number
groups is 3 times greater than by teletype and 7 times greater than by radio using Morse Code.
Subject Heading: 1. Facsimile map transmission.—A.M.P.

8.6-156

551.509.21

Finch, C. R., *The answer to 'Airmet.'* *Weather*, 12(2) 58, Feb. 1957. DWB—Suggests
taking down and plotting short-wave Morse broadcasts from Dunstable and west European
stations. *Subject Heading: 1. Synoptic data.—C.E.P.B.*

8.6-157

551.509.25

Jacobi, Karl, *Fragen der Vorhersagekarten Boden*. [Problems of surface forecast charts. Germany. *Deutscher Wetterdienst, Mitteilungen*, No. 10:41 44, Feb. 1955. 2 figs. DWB—The methods of compiling surface forecast charts used at the analyses center in Frankfurt are described and discussed. It is shown that the shortest and simplest method is the extrapolation of the future position of the pressure systems and fronts with the aid of a so-called "displacement chart" in which the future positions of pressure centers, high pressure wedges, low pressure troughs and fronts during the last 24 hrs are plotted. Their future positions are then extrapolated by the Scherhag or Wegener methods, in consideration of the hitherto existing displacement speed and changes of intensity. The greatest difficulty in the preparation of such forecast charts is the prediction of intensity and trend changes caused by the fact that absolute topography changes constantly in the forthcoming 24 hrs. A table showing the amount of time needed for the preparation of a 06 h surface forecast chart and a discussion of the degree of accuracy of these charts (correlation factor 0.72, accuracy 0.41) as compared with English forecasts are presented in a graph. *Subject Headings*: 1. Prognostic charts. 2. Extrapolation 3. Absolute topography.—A.M.P.

8.6-158

551.509.311:551.515.12/3

Yoshino, Itaru, *On the cold trough*. *Journal of Meteorological Research*, Tokyo, 6(8):347-359, Nov. 1954. 8 figs., table, 3 refs. In Japanese; English summary p. 347. DWB—In this report the author studied the cold trough near Japan which persisted for nearly 4 days, by using the vertical time sections of temperature and pressure at Wajima and Yonago. The vertical structure of the cold trough and the distribution of divergence and convergence are briefly discussed from a synoptic point of view. *Subject Headings*: 1. Cold lows aloft 2. Trough periodicities 3. Japan.—*Author's abstract*.

8.6-159

551.509.317

Ross, Robert B. and Vederman, Joseph (both, *WBAN Analysis Center, U. S. W. B., Wash., D. C.*), *Life history of a great basin anticyclone: an aerological analysis from a hemispheric point of view*. *Monthly Weather Review*, Wash., D. C., 82(12):378-390, Dec. 1954. 17 figs., 11 refs. DWB—The authors examine "the hemispheric features of the circulation aloft associated with the increase and decrease of the Great Basin High of Dec. 16-24, 1954 and explore the vertical structure, especially the variations of the temperature and wind fields." The study includes discussions of the surface synoptic features for the period Dec. 16-24; of the weather during the week in which the Great Basin High existed and of its effects on the U. S. weather; of the circulation at the 700 mb level; of the circulation near the base of the stratosphere (200 mb level); and of a vertical cross section through the anticyclone. *Subject Headings*: 1. Synoptic upper air analysis 2. Great Basin High 3. Atmospheric circulation.—I.L.D.

8.6-160

551.509.317:551.524.37

Suda, K., *On the cold spell in the end of January, 1954*. *Journal of Meteorological Research*, Tokyo, 8(4):226-232, June 1956. 9 figs., 5 refs. In Japanese; English summary p. 226. DWB, DLC—A synoptic study is made based primarily on 10-day and 5-day mean maps for an unusual cold spell which appeared all over the Far East at the end of Jan. 1954, following abnormal warmth. It is found that while it is warm in Japan, cold air accumulates in Siberia to the north of the climatological jet stream and is confined in the northern latitudes by the latter as long as the high index pattern prevails. But once the index drops with the southward displacement of the jet stream, the permanent trough of the Far East deepens and the cold air so far accumulated is allowed to penetrate into southern latitudes. Some characteristic features of contour pattern and frontal activity preceding and following the cold air outbreak are described. Further it is shown that the blocking wave directly related to the cold air outbreak in the Far East can be traced from as far east as North America or possibly the eastern Atlantic. *Subject Headings*: 1. Synoptic upper air analysis 2. Cold spells 3. Far East.—*Author's abstract*.

8.6-161

551.509.318:551.511

Pagava, S. T., **Otvét retsენტentam.** [Reply to reviewers.] *Meteorologija i Hidrologija*, Leningrad, No. 4:57-58, July/Aug. 1955. 6 refs. DLC—Criticism levelled (by T. V. PO-KROVSKAIA and E. S. RUBINSHEIN, *Met. i Gid.*, No. 3, 1955; see 7.10-178, Oct. 1956, *MAB*) against the author's articles dealing with the division of the Northern Hemisphere into natural synoptic regions (*Met. i Gid.*, No. 10, 1953 and *Trudy T. Inst. Prog.*, No. 36, 1954) is reported. The critics maintained that isanomaly charts cannot be used to determine the direction of atmospheric heat flow carried by oceans and continents. PAGAVA points out that in the case of turbulent heat transfer, SHULEIKIN showed that isanomalies characterize the field of the vector of heat flow directed at an angle to the vector of heat flow along the meridian. *Subject Headings:* 1. Synoptic types 2. Advection of heat.—*I.L.D.*

8.6-162

551.509.318

Péczely, György, **A makroszinoptikus helyzetek tipizálása Magyarország számára.** [Typing of large-scale synoptic situations for Hungary.] *Időjárás*, Budapest, 59(4):212-217, July/Aug. 1955. 4 tables. Russian and German summaries p. 212. DWB, DLC—Ten typical synoptic situations are established for Hungary. For the period 1946-1954 the frequency of each type, probabilities of given sequences, and distribution of mean January and July temperature in Budapest according to synoptic types are computed. *Subject Headings:* 1. Synoptic situations 2. Hungary.—*Trans. of author's abstract.*

8.6-163

551.509.319

Berkofsky, Louis and Bertoni, Eugene A. (U. S. A. F. Cambridge Res. Center), **Mean topographic charts for the entire earth.** *American Meteorological Society, Bulletin*, 36(7):350-354, Sept. 1955. 2 figs., 2 tables, ref. DWB, DLC—In order to determine the importance of terrain for forecasts, smoothed topographic maps of the entire earth are necessary. The method of calculating terrain heights is described and maps showing the mean topography of the Northern and Southern Hemisphere and tables giving tabulated averaged heights at five degree lat.-long. intersections for the Eastern and Western Hemisphere are presented. *Subject Headings:* 1. Topographic charts 2. Weather forecasting.—*I.L.D.*

ARTIFICIAL PRECIPITATION

See also: Dry cloudy days, India (Satakopan, Sen), 8.6-299.

8.6-164

551.509.67

Ashford, O. M., **Artificial control of clouds and hydrometeors.** *World Meteorological Organization, WMO Bulletin*, 5(1):28-31, Jan. 1956. photo. DWB—A long review of World Meteorological Organization, **Artificial inducement of precipitation with special reference to the arid and semi-arid regions of the world** (see 6J-289, Oct. 1955, *MAB*), prepared for the WMO Commission for Aerology by a working group presided over by F. H. LUDLAM. The conclusions are that some modification of the clouds occurred in 75% of the cases where super-cooled clouds were seeded; but no quantitative and therefore no predictable results are as yet attainable, and no net increase in precipitation has been established beyond reasonable doubt. Several years of carefully planned experiments are needed. Trans. into Spanish by M. I. Mujica de Pittamiglio appeared in *Revista Meteorológica*, Montevideo, 14(50/51):23-38, June/Dec. 1956. *Subject Headings:* 1. Cloud modification 2. Cloud seeding effectiveness 3. Reviews. I. Ludlam, F. H. II. Mujica de Pittamiglio, M. I. (trans.).—*M.R.*

8.6-165

551.509.67:551.574.1

Bowen, E. G. (*Div. of Radiophysics, C.S.I.R.O.*, Sydney, Australia), **Induced precipitation.** (In: White, Gilbert F. (ed.), **The future of arid lands.** Wash., D. C., American Association for the Advancement of Science, 1956. p. 291-299, 8 figs., 3 refs.) DLC—Experimental studies aiming to determine whether AgI remains effective as a freezing nucleus when exposed in the atmosphere and whether it can attain the required height which, in summer, may be between 14,000 and 20,000 ft. The studies of SMITH and HEFFEMANN and of BOLTON and

QURESHI indicate AgI released from aircraft operating at moderately high altitudes shows a moderately low decay rate and is already at an effective height and that ambient temperature is the most important single factor controlling decay rate. A review of studies on the influence of meteoric dust on rainfall is presented. *Subject Headings:* 1. Cloud seeding with silver iodide 2. Nuclei decay.—*I.L.D.*

8.6-166

551.509.67(673)

†Carreto, Antonio Ferreira, *O problema da precipitação artificialmente provocada*. [Problem of artificially induced precipitation.] Luanda, Angola, Serviço Meteorológico, 1955. 62 p. 6 figs., 2 tables, 27 refs. **DWB**—A long review of the general subject of cloud and precipitation physics and the specific attempts made in South Africa, Tanganyika, India, North and Central America, Australia and Spain; and analysis of conditions most favorable for artificial rainfall inducement in different climates (Africa, Australia, North and South America). A full account is given of results of the U. S. Cloud Physics Project (1948-49) and the Kongwa, Tanganyika, Experiments (1951-52), plus evaluation of operations in Rio Alberche region of Central Spain (1952-53). Conclusion is that no spectacular results of economic value have been demonstrated as yet. Good bibliography—1954. *Subject Heading:* 1. Cloud seeding evaluation.—*M.R.*

8.6-167

551.509.67:551.574.1

*Davies, D. A.; Hepburn, D. and Sanson, H. W., *Report on experiments at Kongwa on artificial control of rainfall*, Jan. April 1952. *East Africa High Commission. Meteorological Dept., Memoirs*, 2(10), 1952. 14 p. 8 figs. (some fold.), 3 refs. For Jan.-April 1951 report, see 3.8-68, June 1952, *MAB*.) **DWB**—A series of rain-making experiments carried out at Kongwa, Tanganyika, during the period Jan.-April 1952 are described and the results are presented in graphic form. Both AgI and hygroscopic particles in water drops consisting of sea salt and calcium chloride were used as seeding agents and their dispersal was effected by means of balloons. The theoretical basis for the use of hygroscopic particles to induce rainfall is discussed and the method of releasing the seeding agent, the preparation of the balloon charges for the AgI and hygroscopic mixtures, and the general weather conditions during the experiments are described. It was found: 1) "that on days when AgI and hygroscopic particles were released the total rainfall in the area of release, on both sets of days, was substantially less than on days when no experiments were conducted; the number of days in each of the three sets of days being the same, 2) on days when hygroscopic particles were released, the total area in the rainfall 6-12 mi downward from the area of release was substantially greater than the total rainfall in the same area on days when no experiments were conducted; and 3) in some cases the release of hygroscopic particles into small cumulus clouds resulted in their complete dispersal." *Subject Headings:* 1. Artificial precipitation 2. Cloud seeding 3. Hygroscopic nuclei 4. Cloud seeding with silver iodide 5. Kongwa, Tanganyika.—*I.L.D.*

8.6-168

551.509.67

Hales, J. Vern; Hoffer, Thomas E. and Peck, Eugene L. (*all, Univ. Utah*), *Area average evaluation of the effects of cloud seeding in Southern Utah*. Prepared for the American Association for the Advancement of Science, June 23, 1955. 10 p. 2 figs., 10 refs. **DWB**—Continuing tests of rainfall variability in Southern Utah and significance of cloud seeding operations in that region (see 6J-308 and 6J-353, Oct. 1955, *MAB*), the authors have tested precipitation for 23 winter months (1951-4) against 73 months (1941-51) when no seeding occurred in that area, and also performed inter-regional evaluations. Indications are that deviations from the mean of 5.4% occurred in the seeded area at the 0.16% level, and of 12.6%, at the 0.01 level, whereas the chance that there was a real increase of 10% would be 0.032 and probability of 20% was 0.0001; thus failing to support claims of a significant increase of 20% to 30% for seeded areas (though the latter claims were based on 36 months of seeding in winter and summer, rather than 23 months of winter data alone). Trends likewise do not appear significant as greater slope has been found in earlier nonseeding years. Regression lines are shown on scatter diagrams. *Subject Headings:* 1. Cloud seeding evaluation 2. Southern Utah.—*M.R.*

8.6-169

551.509.67:551.577.51

Ramage, C. S. and Bell, G. J., **Artificial and orographic stimulation of rainfall in Hong Kong.** *Hong Kong. Royal Observatory, Technical Notes*, No. 13, Oct. 1955. 8 p. 6 figs., 9 refs. DWB—Seeding of clouds with dry ice and AgI is discussed and water seeding by spray intrained into base of cloud from ground, spraying equipment on hills near Hong Kong, is evaluated. It was concluded that water spraying at Hong Kong did not augment rainfall appreciably during period tested (May 1955). Sixty-six gages, of which 11 were automatic, were read once or twice a day. Detailed isohyetal maps of region show comparison between summer, winter and seeding day rainfall in relation to topography. Rough topography is thought to have 10 times the effect that seeding would have on rain stimulation. *Subject Headings*: 1. Artificial precipitation stimulation 2. Cloud seeding with water spray 3. Orographic rainfall 4. Hong Kong.—*M.R.*

8.6-170

551.509.67:551.574.1

Regenmakers steken hun kop in de tropische wolken. [Rainmakers stick their heads into the tropical clouds.] *Hemel en Dampkring*, The Hague, 53(8/9):170-171, Aug./Sept. 1955. DWB, DLC—Discusses BOWEN's experiments of artificial precipitation to be conducted in the Hawaiian Islands and BOWEN's theory of rain formation. *Subject Headings*: 1. Artificial precipitation 2. Bowen's theory 3. Hawaiian Islands.—*I.L.D.*

8.6-171

551.509.67

Sansom, H. W.; Bargman, D. J. and England, G., **Report on experiments on artificial stimulation of rainfall at Mityana, Uganda, September-December, 1954.** *East Africa High Commission. Meteorological Dept., Memoirs*, 3(4), 1955. 6 p. 4 figs., 4 refs. Price: Sh. 3. DWB, DLC—Experiments were conducted by the East African Meteorological Dept. from Sept. to Dec. 1954 in Uganda by means of salt dispersal (balloon bomb technique). The results are evaluated by comparing rainfall amounts on seeding days (selected randomly) with amounts on control days, the former showing considerably higher amounts. Out of 33 clouds seeded 24 yielded precipitation. *Subject Headings*: 1. Cloud seeding in East Africa 2. Cloud seeding with salt 3. Balloon bomb techniques 4. Cloud seeding evaluation 5. Mityana, Uganda.—*G.T.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

COMPOSITION OF THE ATMOSPHERE

See also: **Shape of smoke plumes** (Bryant, Cowdrey), 8.6-24; **Movement of polluted air** (Neiburger), 8.6-27.

8.6-172

551.510.3:551.510.53:551.524.7

Bartman, F. L.; Chaney, L. W.; Jones, L. M. and Liu, V. C. (all, *Engr. Res. Inst., Univ. of Mich., Ann Arbor*), **Upper-air density and temperature by the falling-sphere method.** *Journal of Applied Physics*, 27(7):706-712, July 1956. 6 figs., 2 tables, 7 refs., 22 eqs. DLC—Upper air densities are calculated from data obtained by measuring the trajectory of an inflatable nylon sphere 4 feet in diameter ejected from a rocket at its maximum height. The sphere contains a DOVAP (doppler velocity and position) transponder and antenna. The drag equation is used to calculate the density from the sphere trajectory data. Then by rise of the hydrostatic equations and equations of state of a gas, the temperatures are obtained. The aerodynamics, instrumentation, calculations, errors due to winds, velocity, acceleration, drag coefficient, etc. are treated in detail. Results of 4 rocket ascents at White Sands during May 1952-Sept. 1953 (to 75 or 80 km) are analyzed and presented graphically. *Subject Headings*: 1. Upper atmosphere density 2. Upper air temperatures 3. Falling-sphere method 4. Rocket data 5. White Sands, N. Mex.—*M.R.*

8.6-173

531.52:551.510.3:534

Groves, G. V., **Velocity of a body falling through the atmosphere and the propagation of its shock wave to earth.** *Journal of Atmospheric and Terrestrial Physics*, 10(2):73-83, Feb. 1957. 5 figs., 7 refs., 20 eqs. DWB—Motion of a body falling from a height where air resistance is negligible is calculated. Deceleration is greatest at heights where atmospheric pressure is approximately $p^* = mg \sin \theta / SC_D$ (m = mass, S frontal cross section of body, C_D = drag coefficient, θ = trajectory inclination to horizontal), and rate of loss of energy $\frac{3}{2}p^*$. The shock wave from a vertically falling body such as a nose section of a rocket is then considered. "It is shown that only a part of the shock wave originating in the lower atmosphere will reach earth in the case of falls from above 120 km; but for falls from below this height, an additional part of the shock wave originating in the region of the temperature maximum of 50 km may also reach earth. Curves are plotted showing the horizontal range from the impact point at which shock waves originating in the lower atmosphere reach earth for bodies falling vertically from 100, 200, and 300 km with various values of p^* ." *Subject Headings*: 1. Falling bodies 2. Shock waves.—C.E.P.B., *Author's abstract*.

8.6-174

551.510.3:551.541:523.5

Jacchia, Luigi G., **A preliminary analysis of atmospheric densities from meteor decelerations for solar, lunar and yearly oscillations.** *Journal of Meteorology*, 14(1):34-37, Feb. 1957. 2 tables, 7 refs., 11 eqs. DWB—Densities deduced from 133 meteor paths photographed from 2 stations in New Mexico are discussed. Heights ranged from 74-110 km, mean 91.8. The variations of $\log \rho$ were analyzed for oscillations of 12, 12.42060, 6, 6.21030 hrs and 365.24 days, for all meteors except Geminids, and excluding shower meteors. Only the annual oscillation is statistically significant (amplitude twice probable error); maximum density in Aug. *Subject Headings*: 1. Air density 2. Atmospheric waves 3. Meteor velocities.—C.E.P.B.

8.6-175

551.510.4:551.507.362

Michigan. Univ. Engineering Research Institute, **Atmospheric phenomena at high altitudes.** Contract DA-36-039-SC-15443, Project DA 3-99-07-22, Project SC 172B, Final Report, Jan. 1, 1952-Oct. 15, 1954. issued Dec. 31, 1954. 21 p. 10 figs., 3 tables, 14 foot-refs., bibliog. p. 20, eq. DWB—The results of the development of the air-sampling technique using rockets are described. The results of the analysis of air samples collected in three rocket flights are given together with a brief description of two flights. Possible interpretations of the measurement of diffusive separation in the samples are discussed. The designs of air-sampling instrumentation for subsonic sampling and of a new sample analyzer are described. The design, operation and results of the sphere method for density and temperature are described. The significance of the results obtained is discussed, and recommendations for further research are made. *Subject Headings*: 1. Air sampling and analysis 2. Rocket soundings. I. Jones, L. M.—*Author's abstract*.

ATMOSPHERIC POLLUTION

See also: **Smoke plume met.** (Bryant, Cowdrey), 8.6-24; **Atmospheric pollution trajectory studies**, 8.6-27.

8.6-176

551.510.42:623.454.8:551.578.8

Kellogg, W. W.; Rapp, R. R. and Greenfield, S. M., **Close-in fallout.** *Journal of Meteorology*, 14(1):1-8, Feb. 1957. 7 figs., 5 refs. DWB—Distribution of radioactive material from a surface atomic explosion deposited on the ground within a few hundred miles in 10-20 hours is discussed. Parameters considered are wind structure, particle size and radioactivity, height and size of atomic cloud. Structure of atomic cloud at various stages of development is described. The fallout is computed at intervals from $\frac{1}{2}$ to 6 hrs for cases of high and low wind. Prediction is uncertain but computation after test explosions can reproduce observed fallout patterns within one standard deviation. *Subject Heading*: 1. Radioactive fallout.—C.E.P.B.

UPPER ATMOSPHERE--IONOSPHERE

See also: Physical processes near tropopause (Staley), 8.6-29; Ionospheric investigations (Dieminger), 8.6-31; Upper atmos. rocket research (Boyd), 8.6-62; Eclipse effects on ionosphere (Bates, McDowell), 8.6-352.

8.6-177

551.510.535

Al'pert, Ia. L., *Ionosfera*. [The ionosphere.] *Priroda*, Moscow, 45(1):13-23, Jan. 1956. 11 figs., 2 tables. DLC—The author presents a moderately technical account of the discovery of the ionosphere, the electric properties of the ionosphere such as the concentration and frequency of collisions, the origin and properties of electromagnetic waves, the radio properties of the ionosphere, investigation of the ionosphere by means of rocket flights, the nature of the various ionospheric layers and atomic and subatomic structure of the ionosphere. Data presented in graphs and tables show the dependence of the electron concentrations upon altitude, height, frequency characteristics of the ionosphere recorded during four maximum investigations of E, E2, F and F2 ionospheric parameters at moderate latitude, effective values of the coefficients of photoionization and of effective recombination, etc. *Subject Headings*: 1. Ionosphere 2. Ionospheric structure.—I.L.D.

8.6-178

551.510.535

Appleton, Sir Edward and Lyon, A. J., *Studies of the E layer of the ionosphere*, Pt. 1, Some relevant theoretical relationships. *Journal of Atmospheric and Terrestrial Physics*, 10(1):1-11, Jan. 1957. 11 refs., 34 eqs. DWB—As a preliminary to a detailed study of the E layer, the theoretical basis is considered. The classical Chapman theory of ionized layer production, developed in 1931, does not explain some of the later observations. Developments of the accepted theory are introduced to check experimental data, including assumptions that maximum ionization density in E-layer is quasistationary during daylight hours. Formulas are developed for variations from the simple theory, especially the assumption that the E-layer is influenced by vertical drift. *Subject Headings*: 1. Ionosphere theory 2. E layer.—C.E.P.B.

8.6-179

551.510.535:621.396.11:551.594.5

Chapman, Sydney and Little, C. Gordon, *The nondeviative absorption of high-frequency radio waves in auroral latitudes*. *Journal of Atmospheric and Terrestrial Physics*, 10(1):20-31, Jan. 1957. 3 tables, 21 refs., 14 eqs. DWB—In auroral latitudes the nondeviative absorption of high-frequency radio waves is much more irregular, and often much stronger, than in subauroral latitudes. It is greater and more frequent by day than by night; this is the converse of the daily variation of magnetic activity. The electrons that produce the absorption in subauroral latitudes are mainly caused by solar ultra-violet light; in auroral latitudes, often the major source is bombardment of the atmosphere by solar gas. According to J. A. VAN ALLEN's new interpretation of the soft radiation observed by himself and his colleagues in auroral latitudes, down to 50 km, a small minority of the primary bombarding particles generate X-rays, which penetrate further than the particles themselves. It is here suggested that the layer ionized by these X-rays is an important factor in the daytime radio absorption. Also, as D. R. BATES has pointed out, Lyman-alpha radiation will be generated by the auroral protons; ionization of nitric oxide molecules by this radiation may also contribute appreciably to the absorption. The same processes of ionization will occur likewise at night, and often still more strongly; however, loss of the electrons to form negative ions by attachment is countered by photodetachment during the day, but not at night. Very tentative tables are given, based on these ideas, indicating ionospheric conditions consistent with greater daytime absorption than at night, even when the nighttime bombardment is twenty times more intense than that by day. The corresponding absorption relaxation times, and daily variation of magnetic disturbance, will be examined in a later note. *Subject Headings*: 1. Ionospheric absorption 2. Auroral effects on radio propagation.—Authors' abstract.

8.6-180

551.510.535

Flórián, Endre, Az 1954. évben történt kísérleti ionoszféra-mérések adatainak vizsgálata. [Study of data obtained in experimental ionospheric measurements in 1954.] *Beszámoló az*

1955-ben végzett tudományos kutatásokról (issued as Hungary. Országos Meteorológiai Intézet Hivatalos Kiadványai, Vol. 20, pub. 1955), p. 274-284. 4 figs., eqs. Russian and German summaries p. 274. **DWB**—Data obtained in Hungary in an experimental stage of ionospheric measurement with a hand-tuned instrument are suitable for propagation studies only, not for scientific analysis. More useful data are expected soon. *Subject Heading: 1. Ionospheric research.*—G.T.

8.6-181

551.510.535

Gregory, J. B. (Canterbury Univ. College, Christchurch, N. Z.), **Ionospheric reflection from heights below the E region.** *Australian Journal of Physics*, Melbourne, 9(3):324-342, Sept. 1956. 6 figs., 5 tables, 2 plates, 18 refs. **DLC**—The pulse method of radio sounding has been used at 1.75 Mc/s to detect low ionospheric regions whose voltage reflection coefficient exceeds 4×10^{-6} . Observations from Feb. to July 1955 have revealed reflections, from 98 km vertical height and of day-time occurrence only, which are believed to originate in the lower E region. A region with a lower boundary predominantly at 85 km has been found to exist continuously, and previous suggestions as to its meteor origin are queried. A series of complex partial reflections have been detected during day-time only down to 53 km, with significant heights near 75, 67, and 55 km. The occurrence and strength of these lower reflections increases markedly during winter. From records of high absorption conditions during winter days, a connexion between the decrease in strength of E region reflections and the increase in strength of partial reflections between 66 and 88 km approximately is demonstrated. *Subject Headings: 1. D layer 2. Ionospheric reflection.*—*Author's abstract.*

8.6-182

551.557:551.510.535:551.590.24

Harang, L. and Pedersen, K., **Drift measurement of the E layer during the solar eclipse 30 June 1954.** *Journal of Atmospheric and Terrestrial Physics*, 10(1):44-45, Jan. 1957. 2 figs., ref. **DWB**—Records on 2 Mc/s of E layer drift at Kjeller, Norway, on June 30 are compared with those on July 1 and 2. On eclipse day a normal E layer was embedded in an Es layer at a somewhat greater height. During eclipse drift changed from NE-SW and back again. *Subject Headings: 1. Ionospheric drift 2. Eclipse effects on ionosphere.*—C.E.P.B.

8.6-183

551.510.535:551.594.12

Kelso, John M., **The calculation of ionospheric electron density distributions.** *Journal of Atmospheric and Terrestrial Physics*, 10(2):103-109, Feb. 1957. 5 figs., 15 refs., 4 eqs. **DWB**—Describes a technique for calculating the vertical distribution of electrons, taking account of the earth's magnetic field. The first approximation is taken as a parabola. The procedure is much more rapid than solving the integral equation for true height in the absence of a magnetic field and then correcting for the latter. *Subject Heading: 1. Ionospheric electron density computation.*—C.E.P.B.

8.6-184

551.510.535

Landmark, B. and Lied, F., **Note on a "QL-QT" transition level in the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, 10(2):114-116, Feb. 1957. 3 figs., 2 refs. **DWB**—Referring to article by D. LEPECHINSKY (*Ibid.*, 8(6):297-304, June 1956; see 7.11-161, Nov. 1956, *MAB*), authors point out that at Tromsø there is no transition level associated with an abrupt change of refractive index. A method is outlined by which information may be obtained of electron density between E and F layers. At Tromsø there was no marked decrease in electron density. *Subject Heading: 1. Ionosphere research.*—C.E.P.B.

8.6-185

551.510.535:621.396.11:523.75

Lied, F., **Ionospheric absorption observed on the 23rd February 1956 at Kjeller and Tromsø.** *Journal of Atmospheric and Terrestrial Physics*, 10(1):48, Jan. 1957. fig. **DWB**—Records at Kjeller shown during intense solar eruption of Feb. 23, 1956. Absorption increased gradually from 0400 G.M.T. but echoes were not lost. At Tromsø echoes were lost. *Subject Headings: 1. Ionospheric absorption 2. Solar eruption effects.*—C.E.P.B.

8.6-186

551.510.535:621.396.11

Mitra, S. N. and Mazumdar, S. C., **Some measurements of ionospheric absorption at Delhi.** *Journal of Atmospheric and Terrestrial Physics*, 10(1):32-43, Jan. 1957. 7 figs., 2 tables, 18 refs., 12 eqs. **DWB**—Measurements of ionospheric absorption on 5 and 2.5 Mc/s in June 1954–Dec. 1955 are described. Experimental set-up is shown; it gave $\log \rho$ where ρ = (electric field of reflected polarized wave)/(electric field of corresponding incident wave). Diurnal variation gave $|\log \rho, \alpha (\cos \chi)^n$ where n varied from 0.33–1.13, mean 0.62. Relaxation time averaged 45 min. Difference from theoretical values $n=1.5$ and 8 min. is attributed to the main absorption taking place in the D region. Results of observations after sunset are not clear, but the high residual absorption at night may be due in part to ionization by corpuscular solar emissions. **Subject Headings:** 1. Ionospheric absorption 2. Delhi, India.—*C.E.P.B.*

8.6-187

551.510.535:621.396.029

Whitehead, J. D., **The absorption of short radio waves in the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, 10(1):12–19, Jan. 1957. 7 figs., 4 refs., 2 eqs. **DWB**—It is shown that the reflection coefficients (ρ) measured for radio waves on 2 and 4 Mc/sec reflected vertically from the ionosphere do not fit the expression $-\log \rho = A(f + f_L)^{-2}$ (1) appropriate to "nondeviative" absorption. Since the two frequencies mentioned did not approach near to critical frequencies at the time of the measurements, this failure cannot be ascribed to excessive "deviative" absorption. If the measured values are inserted into the expression $-\log \rho = C + B(f + f_L)^{-2}$ (2) it is found that (a) C varies with the sun's zenith angle but not with solar epoch (b) B is a very variable quantity, it depends on the solar epoch and is greatest in winter. With values of B and C deduced from measurements on 2 and 4 Mc/sec, equation (2) gives a reasonable approximation to the measured values of ρ on 2.4, 3.2, and 4.8 Mc/sec. It is suggested that waves in the frequency range 2 to 4.8 Mc/sec are appreciably absorbed outside the nondeviating region, where equation (1) is appropriate. **Subject Headings:** 1. Ionospheric absorption 2. Short wave radio absorption.—*Author's abstract.*

8.6-188

551.510.536

Kallmann, H. K., **Estimate of average atmospheric properties between 500 km and 1000 km.** *Rand Corporation, Santa Monica, Calif., Research Memorandum RM-1505*, June 21, 1955. 16 p. 2 figs., 3 tables, 8 refs., 12 eqs. **DWB**—An estimate of the atmospheric densities at altitudes between 500 km and 1000 km has been made. Since no direct observations are available of any of the physical properties of the atmosphere at these heights, the analysis has been based upon deductions made from other information. Due to large changes in electron densities and changes in wind velocities, both of which have been observed, a large variation in individual particle density can be expected. By studying different atmospheric models, the results can be summarized as follows: At an altitude of 800 km (500 mi), the maximum and minimum particle concentration are of the order of 10^6 to 10^5 particles per cm^3 ; and the maximum and minimum densities are of the order of 1×10^{-17} to 5×10^{-17} gm per cm^3 . **Subject Heading:** 1. Exosphere.—*Author's abstract.*

8.6-189

546.11:551.510.536:551.594.6

Storey, L. R. O., **A method to detect the presence of ionized hydrogen in the outer atmosphere.** *Canadian Journal of Physics*, 34(11):1153–1163, Nov. 1956. 4 figs., table, 12 refs., eqs. **DWB, DLC**—The method proposed for the detection of ionized hydrogen in the outer atmosphere relies on the influence of the positive ions on the propagation of whistlers. If ionized hydrogen is the chief constituent of the atmosphere at great heights above the earth, then the relation between frequency and time in a whistler should depart at low audio frequencies from the form observed at higher frequencies. The departure is likely to be most marked in whistlers occurring at low magnetic latitudes. At magnetic latitude 45° the effect of the hydrogen ions should be detectable at frequencies below about 2 kc./sec. **Subject Headings:** 1. Hydrogen in upper atmosphere 2. Whistlers.—*Author's abstract.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: Micromet. diffusion formulae (Holland), 8.6-25; Physical processes near tropopause (Staley), 8.6-29; Lower level diffusion computations (Tank), 8.6-121; Synoptic types (Pagava), 8.6-161; Hemispheric wave number . . . (Jung et al.), 8.6-200; Diurnal wind variations (Reshetov), 8.6-251; Vertical motion and cyclogenesis (Fisher), 8.6-269; Inversion effects on convection (Vehrencamp et al.), 8.6-271; Turbulence in convective clouds (East), 8.6-275.

8.6-190

551.511.13:551.524.31

de Vries, D. A., On the integration of the heat-conduction equation with periodic variation of temperature. *Journal of Meteorology*, 14(1):71-76, Feb. 1957. fig., 2 tables, 25 refs., 27 eqs. DWB—A procedure is given for integrating Fourier equation of heat conduction with diffusivity depending on height in a layered atmosphere and varying periodically with time. The theory is applied to evaluation of thermal diffusivity K and thermal conductivity κ from observed amplitudes A and phase ϕ of temperature variations, and *vice versa*, but in concluded that K cannot be evaluated in practice, being very sensitive to apparently insignificant changes of A and ϕ . Values of K at heights above 100 m and very close to the surface greatly influence A and ϕ . *Subject Headings*: 1. Thermal diffusivity 2. Diurnal temperature variations.—C.E.P.B.

8.6-191

551.511.13:546.22

Tippelskirch, H. von, Über Konvektionszellen, insbesondere im flüssigen Schwefel. [On convection cells, especially in liquid sulfur.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 29(1):37-54, 1956. 28 figs. (incl. photos), table, 10 refs. German, English and French summaries p. 37. DLC, DWB—The main part of the investigation deals with the question why the flow in Bénard convection cells is in the opposite sense in fluids and gases. GRAHAM has suggested that this may be a consequence of the opposite dependence of viscosity on temperature in fluids and gases, so that in both cases the flow in the middle of the cell takes place in the direction of increasing viscosity. H. KOSCHMIEDER pointed out to the author that this suggestion can be submitted to an experimental test: For liquid sulfur the direction of the circulation would have to reverse itself at approximately 153°C according to the viscosity-temperature curve. The experiments which are described here show that this reversal of the circulation actually takes place. The main part is preceded by a section on the temperature distribution in convection cells and is followed by a description of individual cells. It is assumed that those basic facts about cellular convection are known which are discussed in the article *Experimental cloud formation* by SIR DAVID BRUNT (see 4.2-1, Feb. 1953, MAB) in the *Compendium of Meteorology*. *Subject Heading*: 1. Convective cell theory.—*Author's abstract*.

8.6-192

551.511.32

Fortak, H., Zur Frage allgemeiner hydrodynamischer Wirbelsätze. [On general hydrodynamic vorticity.] *Beiträge zur Geophysik*, Leipzig, 65(4):283-294, 1956. 17 refs., 48 eqs. German and English summaries p. 283. DLC, DWB—At first a number of differential operators are defined which are suitable to study the rate of change with regard to the time of any tensor function associated with a given line, an area, or a volume of particles in the fluid. The use of these differential operators allows one to write general hydrodynamic vorticity equations, containing an available tensor function, in a very simple and physically evident manner. *Subject Headings*: 1. Hydrodynamics 2. Vorticity theory.—*Author's abstract*.

8.6-193

551.511.33:551.541:551.558.21

Eliassen, A. and Palm, Enok, Energy flux for combined gravitational-sound waves. *Norske Videnskaps-Akademi i Oslo. Institutt for Vaer- og Klimaforskning, Publication*, No. 1, 1954. 16+6 p. fig., 5 refs., numerous eqs. Also: Oslo. Universitet. *Institutt for Teoretisk Astrofysikk, Publication*, No. 3, 1954. DWB—The energy flux associated with combined gravitational-sound waves is computed. Whereas waves with horizontal propagation always convey energy in the direction of propagation, waves with vertical propagation will convey

energy in the opposite direction if they are of predominantly gravitational character. The notion of energy flux is applied to the problem of mountain waves, and it is shown that the requirement that the energy flux shall everywhere be directed upwards suffices to determine the stationary motion uniquely. *Subject Headings:* 1. Stationary wave theory 2. Lee waves

1. **Energy flux in standing waves.**—*Authors' abstract.*

8.6-194

551.511.6:551.551

*Benton, G. S. and La Seur, N. E., **The space-time distribution of atmospheric eddies.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 24:89-97, Nov. 1953. 6 figs., table, 3 refs., eqs. *AFCRC Technical Report*, 53-35. DWB, DLC—In analysis of turbulent motion and in the specific problem of moisture transport, it is important to differentiate between the usual space-time eddies which decay and are averaged out in the mean flow patterns, and the "pure space eddies" or "pure time eddies" which are not averaged out on long period mean charts. For instance, the mountain ranges, continents and oceans produce eddies in mean flow (pure space eddies) and diurnal or seasonal changes produce pure time eddies. These "pure eddies" in space or time are defined in mathematical terms, in example of 2-dimensional eddy transfer analysis given (eddy transport of water vapor at New Orleans in March 1949), and equations presented which can be applied to transfer of a physical quantity, such as angular momentum, across a circle of latitude. *Subject Headings:* 1. Space-time eddies 2. Eddy transfer calculations 3. New Orleans, La.—*M.R.*

8.6-195

551.511.6:551.513.1

Gião, Antonio (*Paris*), **Sur le comportement du vecteur d'advection des perturbations et du tourbillon vertical en altitude.** [Behavior of the advection vector of perturbations and of vertical vorticity with height.] *Geofisica Pura e Applicata*, Milan, 34:151-176, 1956. 9 figs., 11 refs., 78 eqs. French and English summaries, p. 151-152. DLC—The important problem of the "advection of the perturbations" can be treated along rational lines and acquires a precise meaning only when its treatment is based, on the one hand, on the analysis of the general mathematical properties of any perturbation function, and on the main results of the hydrodynamical theory of perturbations, on the other hand. In this way, the notion of the "advection vector of the perturbations" can be completely clarified and it can be shown that the important differences between the motion of the perturbations at sea level (which is determined by a mean temperature field) and in the free atmosphere (where the perturbations move rather with the mean wind, at least in the middle troposphere) are easily explained by the behavior of the *same* vectorial advection function which plays an essential part in our theory of perturbations. By means of the observed fields of temperature and wind between the equator and the poles (from sea level to the 20 km level) we deduce the mean field of the advection vector of the perturbations and compare it to the mean wind field. This leads to the explanation of many important empirical facts and also gives the limits of the region where "long waves" (compatible with the conservation of vertical vorticity) can exist, and also the characteristic wavelength of these perturbations. In the second part of the paper, a simple transformation of the equation for pressure variations of our theory of perturbations leads to a generalized equation for the vertical vorticity, which can be compared with the classical vorticity equation derived from the hydrodynamical equations. The condition of the conservation of the vertical absolute vorticity can then be appreciated as a particular case of our equation of pressure variations. *Subject Headings:* 1. Vorticity theory 2. Perturbation equations.—*Author's abstract.*

8.6-196

551.511.6

Ogura, Y., **Spectrum modification due to the use of finite differences.** *Journal of Meteorology*, 14(1):77-80, Feb. 1957. 3 figs., 6 refs., 13 eqs. DWB—The modification of the vorticity spectrum associated with the use of finite differences instead of derivatives is considered for an isotropic turbulence field. The results permit a rough estimate of the dependence of the magnitude of vorticity on the grid spacing. *Subject Heading:* 1. Vorticity computations.—*Author's abstract.*

8.6-197

551.511.6:551.513.4

Ogura, Y., Wave solutions of the vorticity equation for the $2\frac{1}{2}$ -dimensional model. *Journal of Meteorology*, 14(1):60-64, Feb. 1957. 3 figs., table, 19 refs., 20 eqs. DWB—Wave solution of the non-linear quasi-geostrophic equations for the so-called " $2\frac{1}{2}$ -dimensional model" without friction are derived. The solutions describe wave motions which propagate at different speed in each layer. The amplitudes of the disturbances are either changing periodically with time (stable waves) or increasing exponentially (unstable waves). The critical value of wave length, at which waves maintain a constant amplitude, is expressed as a function of thermal stability and of vertical wind shear in the basic current. It is also found that, while the inclination of trough lines to the vertical increases monotonically with time in stable waves it varies very slowly in the unstable waves and tends to approach a certain limiting value. *Subject Headings: 1. Vorticity equations 2. Long waves.—Author's abstract.*

GENERAL CIRCULATION

See also: Planetary jet stream models (Freeman), 8.6-2; Wind fields near tropopause (Texas. Agr. Mech. College), 8.6-5; Advection vector of perturbations (Gião), 8.6-195; Vorticity eqs. (Ogura), 8.6-197; Pressure oscillations, N. Hemisphere (Schumann), 8.6-243; Zonal wind circulation and vertical temp. distribution (Mooley), 8.6-263; Jet stream (Ramamurthi), 8.6-264; Frequency distribution of high velocity wind currents, Texas (Cunningham), 8.6-265.

8.6-198

551.513:551.515.11

Raethjen, Paul (*Dept. of Met. and Oceanog., N. Y. Univ.*), General circulation and cyclogenesis. *New York Academy of Sciences, Transactions*, Ser. 2, 18(2):144-160, Dec. 1955. 7 figs., 8 refs. DLC—The circulation of the atmosphere can be divided into two components, the planetary circulation (see FERREL's scheme derived 90 yrs ago) and the monsoonal circulation, caused by the continents. Cyclogenesis would occur even without continents. Frontal zones (the main feature added to the model since Ferrel) may be planetary in nature but sometimes coincide with coast lines. An unusual synoptic example (April 25-29, 1951) starting with blocking and ending with a 500 mb cut-off low attempts to show that a cyclone is a vortex, not a wave, and may be caused by wedge injections of polar stratospheric air into the subtropic troposphere, isentropically between parts of the broken tropopause. This wedge injection results in horizontal shrinking, vertical stretching and resulting increase in vorticity in the upper troposphere. A model from 90°N to 90°S or 90°-0° summer and winter is presented to 25 km height to show isotachs and meridional circulations in relation to the tropopause, which is considered as a down gliding surface under normal conditions. *Subject Headings: 1. Cyclogenesis 2. Tropopause circulation 3. General circulation models.—M.R.*

8.6-199

551.513.2:551.557:551.524.7

Cunningham, N. W., A study of thermal wind in the vicinity of a jet stream. Texas. Agricultural and Mechanical College. Dept. of Oceanography, Contract AF 19(604)-559, Scientific Report No. 8, July 1956. 25 p. 11 figs., 3 tables, 3 refs. DWB—Wind and temperature data from a specially instrumented B-29 aircraft, operating near 400 and 300 mb, are used to test the thermal wind equation in the vicinity of a middle-latitude jet stream. Analyses of the data at the two levels are presented with respect to both the small- and large-scale distribution of wind and temperature. The geostrophic wind shear between the two levels is calculated for horizontal temperature gradient computed over varying distances, and these are compared with the vertical shear obtained from aircraft-measured winds at the midpoint of each interval over which the temperature gradient is measured. The flow patterns at the two levels are considered in determining the ageostrophic components of the wind due to curved flow, and these corrections are applied in the final comparisons of calculated and aircraft-measured shear. A method using averaged winds at the lower level of the layer suggests that this may be a more representative reference than "spot winds" for approximating the wind above when using the thermal wind relation. *Subject Headings: 1. Jet stream structure 2. Thermal wind.—Author's abstract.*

8.6-200

551.513.2:551.515:551.511

Jung, Glenn H.; Hildreth, William W., Jr. and Glasser, Arnold H., **The hemispheric wave number as a weather type for long-range forecasting.** Texas. Agricultural and Mechanical College. Dept. of Oceanography. Contract AF 19(604)-1301, Scientific Report, No. 1, May 1956. 18 p. 12 figs., 27 tables, 7 refs. DWB The hemispheric wave number is suggested by model studies as a description of the general circulation. The persistence of wave number in the model indicates that wave number might be used as a long-range forecasting aid. The hemispheric wave number was obtained by visual inspection of 500 and 100 mb charts for the years 1946-47 and 1952-54. The wave number tends to have two values, one characteristic of high latitudes, the other of mid-latitudes. The high latitude wave number has small variation about the modal number 4. The mid-latitude wave number shows greater variability. Both sets of wave numbers show relatively small persistence, whether tested by autocorrelation or chi-square techniques. Persistence is insignificant beyond five days. A hint was found of recurrence of wave number at 27-day intervals, suggestive of solar influence. No improvement of persistence resulted from modification of the wave number concept to include significant aberrations from symmetrical flow. No immediate relationship was found between wave number and weather characteristics at a fixed point on the earth's surface (College Station, Texas). *Subject Headings:* 1. Waves in the westerlies 2. Zonal flow stability.—*Authors' abstract.*

8.6-201

551.513.2:551.557:518.6

Kasahara, Akira, **Three dimensional structure of small-scale atmospheric perturbations aloft.** Texas. Agricultural and mechanical College. Dept. of Oceanography, Contract AF 19(604)-559, Scientific Report No. 7, June 1956. 39 p. 16 figs., table, 7 refs., 7 eqs. DWB—Small-scale disturbances having scales of several hundred kilometers or less are frequently observed in the jet stream by aircraft flights such as those of Project Jet Stream. In order to determine the meteorological features of these disturbances, a theoretical investigation is made. The perturbation equations are derived from the equations of motion, of continuity, and of polytropic change of state. The meteorological patterns are found and illustrated for a perturbation which is superimposed upon a steady uniform zonal current. The results are useful in establishing a theoretical basis for interpreting the observed features appearing in the flight data. *Subject Heading:* 1. Jet stream perturbation equations.—*Author's abstract.*

8.6-202

551.513.2:551.557

Koteswaram, P., **Easterly jet stream in the tropics.** Chicago. Univ. Dept. of Meteorology, Contract N6ori-02036, Project NR 082-120, Report on Research [unnumbered], May 1956. 23 p.+11 figs., 30 refs. DWB—It is shown that in summer an easterly jet stream overlies southern Asia in the high troposphere with core near 15°N. This current is quasigeostrophic. Below the level of strongest winds temperatures decrease from right to left across the current looking downstream; above the level of strongest wind (150-100 mb) the reverse is true. Distribution of cloudiness and precipitation in the lower monsoon correspond to that noted in association with westerly jet streams in the temperate zone: precipitation downstream from the region with highest winds to the left of the axis, upstream to the right. The foregoing holds on individual days and climatically during the monsoon season as a whole. Since an easterly jet stream is observed only over southern Asia (and Africa), but not over the Pacific and Atlantic oceans, it is suggested that the current originates in connection with the large-scale arrangement of land masses and oceans, and with the elevated heat source of the Tibetan plateau. *Subject Heading:* 1. Easterly jet stream.—*Author's abstract.*

8.6-203

551.513.2

Mintz, Yale and Lang, John, **A model of the mean meridional circulation.** (In: California. Univ. at L. A. Dept. of Meteorology, Contract AF 19(122)-48, General Circulation Project, **Final Report**, March 15, 1955, Article 6. 10 p. fig., 2 tables, 6 refs., 8 eqs.) DWB—Streamlines of mean meridional circulation are derived for winter and summer 1949. Tables give the

poleward mass flux near meridional wind, upward mass flux and mean vertical velocity. The theory utilizes Mintz's equation of motion for the spherical earth, averaged with longitude and time. The computational method is outlined. *Subject Headings: 1. Meridional circulation profiles 2. General circulation 3. Northern Hemisphere.—A.A.*

8.6-204

551.513.2:551.557:016

†Rodríguez Franco, Pedro, *Notas sobre las corrientes de chorro*. [Notes on the jet stream.] *Revista de Geofísica*, Madrid, 14(56):313-346, Oct./Dec. 1955. 17 figs., 44 refs. English summary p. 313. **DWB, DLC**—A most complete review of the principle discoveries and works on the jet stream from 1946 to date. The discovery, relation to polar front, height, speed, cross sectional appearance, relation to tropopause, double jet streams, latitudinal variations, cyclogenetic effect, precipitation in vicinity, analysis by means of 500 or 300 mb charts or cross sections, confluence, structure, forecasting, etc., are discussed and illustrated with charts taken from several of the numerous works cited, as well as with original drawings. *Subject Headings: 1. Jet stream 2. Jet stream bibliographies.—M.R.*

8.6-205

551.513.3(264)

§van Loon, H., *Description of a blocking situation in the central South Atlantic Ocean (April 29-May 11, 1956)*. *South Africa. Weather Bureau, Notas*, 5(2):117-119, 1956. 10 figs., 2 refs. **DWB**—A case of blocking in the central part of the South Atlantic Ocean is described using synoptic charts at two-day intervals, a mean pressure map for the 13-day period concerned, and a map showing the deviation of the pressure from the normal for the period. It is pointed out that the blocking occurred in a region where such developments are rare. *Subject Headings: 1. Blocking action 2. South Atlantic.—Author's abstract.*

ATMOSPHERIC DISTURBANCES

See also: Hurricanes (Hogan), 8.6-53; *Effect of weather on rabbits* (Lotmar, Häfelin), 8.6-107; *Cold trough* (Yoshino), 8.6-158; *Circulation and cyclogenesis* (Raethjen), 8.6-198; *Hemispheric wave number* (Jung et al.), 8.6 200; *Dynamic climatology* (Gião, Ferreira), 8.6-343; *Thunderstorm charge generation* (Kano), 8.6-361.

8.6-206

551.515.2

§Rodewald, M., *Der Taifun WANDA*. [The typhoon Wanda.] *Wetterlotse*, No. 111:22-23, Jan. 1957. fig. **DLC**—Weather chart for Aug. 3, 1956, reproduced from Royal Observatory, Hong Kong showed that the typhoon remained unusually large and deep (984 mb) over the continent. Considerable damage was done. *Subject Heading: 1. Typhoon "Wanda" (1956).—C.E.P.B.*

8.6-207

551.515.2

Rodewald, M., *Der äquatornahe Taifun ROSE*. [The equatorial typhoon "ROSE."] *Wetterlotse*, No. 112:37-38, Feb. 1957. **DLC**—Jan. 22, 1957, warning from Guam of a typhoon probably S of 4.8°N, unusually near the equator. *Subject Heading: 1. Typhoon "Rose" (1957).—C.E.P.B.*

8.6-208

551.509.52:551.515.2(265) 551.515.2:550.342

Savarenskiĭ, E. F.; Proskuriakova, T. A. and Tsirel'-Sprintsson, V. S., *O sviazi mezhdu mikroiseimicheskimi kolebaniiami i polozheniem tsiklonov nad okeanami*. [Relationship between microseismic oscillations and location of cyclones over oceans.] *Meteorologiya i Gidrologiya*, Leningrad, No. 6:13-18, Nov./Dec. 1955. 3 figs., 8 refs. **DWB, DLC**—A study of microseisms having a period of 3-9 sec, a true sinusoidal form and an amplitude of 100 μ , studies on the relationship between typhoons, cyclones and ocean storms and the origin of microseisms in the U.S.S.R. and elsewhere, and Longuet-Higgins theory on the role of standing waves in the production of microseisms and the mechanism of origin of microseisms as a result of cyclones are reviewed. By means of the presently used method of determining the direction of origin of microseisms, by measuring the difference in time of occurrence of the same phase

of oscillation on three seismographs situated at the vortexes of a triangle, the author determines the location of cyclones in the Pacific Ocean on Feb. 16, 1955 (shown on a map). *Subject Headings:* 1. Microseismic storm detection 2. Cyclonic microseisms 3. Microseism-cyclone relationships 4. Pacific Ocean.—*I.L.D.*

8.6-209

551.515.22:551.577.11

Gilbert, Sterling C. and LaSeur, N. E., A study of the rainfall patterns and some related features in a dissipating hurricane. *Journal of Meteorology*, 14(1):18-27, Feb. 1957. 13 figs., table, ref. DWB—Hourly rainfall patterns over south-eastern U.S.A. are drawn for hurricane "Florence," Sept. 26-27, 1953. Although symmetry of storm was not distorted, in area of little or no rain appeared in right rear quadrant and spread rapidly inland, between maxima in S.E. Alabama and S.E. Georgia, tracks of which are plotted. Upper air data showed very dry air above 800 mb in southern Mississippi valley and Great Plains, and a tongue of this air swept cyclonically around the storm, inhibiting rainfall. (For abstract on same paper from different source, see 71-181, Sept. 1956, *MAB.*) *Subject Headings:* 1. Hurricane rainfall 2. Hurricane "Florence" (1953) 3. Southeastern United States.—*C.E.P.B.*

8.6-210

551.515.3

Waterspouts [in] North Atlantic Ocean [and] Scorpanto Strait. *Marine Observer*, 27(175):10-11, Jan. 1957. sketch. DLC—March 4 and 5, 1956, waterspouts in mid-Atlantic. On Jan. 7, 1956, in 35°38'N, 27°42'E, ship passed through center of a waterspout, external diameter 1000 yd, eye 400 yd. Wind anticyclonic force 10-12. Bar fell suddenly from 1009.7 to 1000.2 mb and rose again to 1009.5 mb. *Subject Heading:* 1. Waterspouts.—*C.E.P.B.*

8.6-211

551.515.4:551.571

§Rein, František, Pravděpodobnost výskytu bouřek v Praze jako funkce tlaku par. [Probability of thunderstorm occurrence in Prague as a function of vapor pressure.] *Meteorologické Zprávy*, Prague, 5(4):100-102, 1952. 4 figs., 3 tables, 2 refs. English summary p. 100. DLC—This study is based on thunderstorm data and vapor pressure values (7 a.m.) at Prague for the 30-year period 1922-1951 during the summer season (May-Aug.). Thunderstorm probabilities at specified vapor-pressure values are tabulated and presented graphically for each of the four months and for the whole season. An average correlation coefficient of 0.74 is found between vapor pressure and thunderstorm probability over the entire range of vapor-pressure values; for vapor pressure values exceeding 10 mm Hg the correlation coefficient is 0.92. The correlation investigated is consequently useful in forecasting thunderstorms from May to Aug. *Subject Headings:* 1. Thunderstorm-vapor pressure relationships 2. Thunderstorm probability 3. Prague, Czechoslovakia.—*G.T.*

8.6-212

551.515.42(100)

Ramakrishnan, K. P. and Rao, D. S. V. (*Met. Office, Poona*), Distribution of thunderstorms over the world. *Indian Journal of Meteorology and Geophysics*, Delhi, 6(2):171-175, April 1955. 5 figs., 9 refs. DWB, DLC—Revised maps showing the distribution of number of days with thunderstorms over the whole world (both for land and sea) are presented. The sources of data and procedure of compilation are described. The maps show average number of days with thunderstorms per year and in quarters. *Subject Headings:* 1. Thunderstorm distribution 2. World thunderstorms.—*I.L.D.*

8.6-213

551.515.73:523.74

†§Brádka, J., Kolísání četnosti anticyklon nad Evropou a Atlantickým oceánem během roku a v 11-letém slunečním cyklu. [Variation of the frequency of anticyclones over Europe and the Atlantic Ocean in the course of a year and an 11-year solar cycle.] *Meteorologické Zprávy*, Prague, 5(2):33-40, 1952. 4 figs., table, 29 refs. French summary, p. 33. DLC. Review by György Péczely in *Időjárás*, Budapest, 58(5):323-324, Sept./Oct. 1954. DWB—Dynamic factors, which affect the Atlantic frontal zone, play an important part in the formation of anticyclones over the Atlantic Ocean and, to a certain extent, over the European continent.

The position and intensity of such anticyclones is influenced by annual variations of tropospheric temperature caused by changes of insolation and by the profile of the earth's surface. As a result of disturbances of the Atlantic frontal zone, especially in winter and spring, anticyclones form in Jan. in high latitudes over Scandinavia and northern U.S.S.R. and in April over the middle and northeastern Atlantic. The effect of solar activity on the distribution of anticyclones is greatest in winter and spring, when maximum solar activity invariably produces an intensification of the general circulation accompanied by an increase in the number of anticyclones in northern latitudes (blocking). In summer and fall the relation between solar activity and anticyclone frequency is more complicated. *Subject Headings:* 1. Anticyclone frequencies 2. Solar cycle 3. Frontal zones 4. Atlantic Ocean 5. Europe.—*Trans. of author's abstract.*

8.6-214

551.515.83

Boville, B. W. and Creswick, W. S., Comments on [Richard J. Reed]: A study of a characteristic type of upper-level frontogenesis. Reply by Reed. *Journal of Meteorology*, 14(1):91-93, Feb. 1957. 11 refs. DWB—BOVILL and CRESWICK criticize REED's paper (*J. of Met.*, 12(3):226-237, June 1955; see 6.9-170, Sept. 1955, *MAB*) as a generalization of a particular case against synoptic experience, and on details of analysis. REED replies at length justifying his analysis. *Subject Heading:* 1. Frontogenesis.—*C.E.P.B.*

RADIATION AND TEMPERATURE

RADIATION

See also: Solar energy journal, 8.6-57; Actinometer for UV (Sekihara, Kawamura), 8.6-138; Scintillation detectors (Lundby), 8.6-139; Frequency curves of pentad temp., Budapest (Péczely), 8.6-237.

8.6-215

551.521:551.311.12

Dirmhirn, Inge, Studie über die Strahlungsvorgänge auf Gletschern. [Studies of the radiation processes on glaciers.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 8(1):31-55, 1957. 4 figs., 5 tables, 28 refs. German, English and French summaries p. 31-33. DWB—Radiation balance of a glacier measured as a whole is not accurate. Methods of determination of components are discussed; partial sums of short and long wave radiation and reflection have advantages. Measurements of light of different colors (UV to dark red) penetrating clean saturated firn and dirty glacier ice are tabulated. Exchange of long wave radiation is almost confined to the surface but short wave solar and sky radiation penetrates to a depth of some cm. Diurnal variations of radiation processes in ice and firn are plotted. From the balance of long wave and short wave radiation and the albedo melting can be divided into surface and internal ablation. Clear glacier ice containing air bubbles melts into a very rugged surface layer. *Subject Headings:* 1. Radiation balance on glaciers 2. Ablation.—*C.E.P.B.*

8.6-216

551.521:551.311.1(54)

Untersteiner, N., Glazial-meteorologische Untersuchungen im Karakorum. I. Strahlung. [Glacial-meteorological investigations in Karakorum, Pt. 1, Radiation.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 8(1):1-30, 1957. 8 figs., 8 tables, 41 refs. German, English and French summaries p. 1-2. DWB—Records of global and sky radiation and weather were made at 4000 and 4300 m on Chogo-Lungma Glacier in summer 1955. These showed high daily totals of global radiation (some >800 cal/cm²), decreasing much more slowly with increasing cloudiness than in the Alps. Solar radiation also decreases slowly at first with increasing cloud. Sky radiation is greatest with cloud 8/10. Short wave radiation balance and albedo of firn and ice are also evaluated hourly. Long wave radiation was not measured but was computed by the Elsasser diagram from an assumed distribution of temperature and vapor pressure, and from Ångström's formula. The total radiation balance is then computed by day and by night. A few radiation measurements at 4900, 5700 and 6400

are plotted; they show that with an albedo of 0.75, melting of snow is rare. *Subject Headings:* 1. Radiation balance on glaciers 2. Karakorum Mountains. —C.E.P.B.

8.6-217

551.521.1

Arakawa, Hidetoshi and Tsutsumi, K. (both, *Met. Res. Inst.*), **A decrease in the normal incidence radiation values for 1953 and 1954 and its possible cause.** *Geophysical Magazine*, Tokyo, 27(1):205-208, Jan. 1956. fig., 12 refs. DWB, DLC —A time-scatter diagram shows % of normal (1932-54) monthly mean solar radiation (normal incidence) received at Tokyo, Fukuoka, Matsumoto and Shimizu (33°-36°N) in Japan from 1932-1954, inclusive. It is evident that a downward trend occurred in 1953 and 1954 corresponding with cool summers in Japan. This may have been due to: 1) volcanic eruption in Alaska (Mt. Spurr) on July 9, 1953, 2) atomic tests in Pacific in 1952 and 1954, and in Russia in Aug. 1953, or 3) increased pollution due to industrial activity in Japan since the war. Letters and papers both published and unpublished on the effects of the volcanic eruption, decreased radiation, etc. are quoted or cited. *Subject Headings:* 1. Solar radiation decrease 2. Volcanic dust 3. Japan. —M.R.

8.6-218

551.521.1:551.501:681.2

Kassander, A. Richard and Knowles, Lyle L., **An automatic printing and totalizing device for solar radiation measurements.** *Arizona Univ. Institute of Atmospheric Physics, Scientific Report*, No. 1, March 1, 1956. 6 p. 4 figs. (incl. photos), table. DWB —A device is presented which performs the time integration operation when hourly totals of incoming solar radiation are desired. This device, which is coupled to a standard self-balancing potentiometer type of recorder, samples the record each minute and prints out the indicated value. After fifty such samples are taken the total is then printed as well as the time of day. The operation starts and stops automatically at pre-set dawn and dusk times. *Subject Headings:* 1. Solar radiation measurement 2. Automatic recorders 3. Computing machines. —Authors' abstract.

8.6-219

551.521.1(675)

†*Schuepp, W., **Le rayonnement solaire à Stanleyville, Congo Belge.** [Solar radiation in Stanleyville, Belgian Congo.] *Belgium. Académie Royal des Sciences Coloniales. Classe des Sciences Naturelles et Médicales, Mémoires* in 80, n.s., 2(1), 1955. 43 p. 18 figs. (incl. photos), 12 tables, 18 refs., eqs. DWB. Also issued as: *Belgian Congo. Service Météorologique, Publication*, No. 6, 1955.—An analytical study of the global and sky radiation measurements made during 1952 and 1953 at Stanleyville Airport, Belgian Congo, with a Moll, a Robitzsch and an Eppley pyrhelimeter. Data are compared with those for Leopoldville and other radiation stations, and are presented in tables showing daily, half-daily, hourly, decadal and monthly values, and in numerous graphs, histograms, etc. It was found that global radiation reached a peak after noon, but sky radiation before noon. The effect of cloudiness, low cloudiness, the relation to temperature and hours of sunshine, the rainy season, geographical and latitudinal factors, turbidity, etc. are brought out clearly. *Subject Headings:* 1. Global radiation data 2. Solar radiation 3. Stanleyville, Belgian Congo. —M.R.

8.6-220

551.521.1:551.524:551.525.2

Wegener, Kurt (*Inst. für Met. und Geophysik, Graz Univ., Austria*), **Die Beziehung zwischen Luft-Temperatur, Sonnen-Strahlung und Boden.** [Relation between atmospheric temperature, solar radiation and soil.] *Geofisica Pura e Applicata*, Milan, 34:74-78, 1956. 2 figs., 3 refs. German and English summaries p. 74. DLC —The results of the German Grönlandexpedition Alfred Wegener are used to give a picture of the relation between air temperature, solar radiation and the soil. *Subject Headings:* 1. Solar radiation effects on temperature 2. Soil temperature.—Author's abstract.

8.6-221

551.521.11

Dreyer, Gudrun, **Beitrag zum Problem der Iterationen bei Sonnenscheinbeobachtungen.** [Contribution to the problem of sequence of sunshine observations.] *Zeitschrift für Meteorologie*, 10(10):313-316, Oct. 1956. 2 tables, 3 refs. DLC —A statistical study of daily sunshine values at Potsdam, 1893-1955, shows a tendency to persistence in winter, but in summer question remains open. *Subject Heading:* 1. Sunshine persistence.—C.E.P.B.

8.6-222

551.521.11(43)

Tunnell, G. A., A statistical analysis of vertical variation of sunshine over Germany. *Meteorological Magazine*, London, 86(1016):41-46, Feb. 1957. 3 figs., table, 7 refs., eq. DWB—Monthly averages of S for about 40 stations, 1924-33, were fitted to $Ah+B\lambda+C\phi+D$, h =height in m, λ lat °N, ϕ long °E, $A-D$ constants. r_{sh} varied from +0.88 in Dec. to -0.68 in May. The relations hold to a height of 3000 m. *Subject Headings: 1. Sunshine variations 2. Germany.—C.E.P.B.*

8.6-223

551.521.2

Henschel, Karin, Theoretische Betrachtungen über empirische Formeln der Gegenstrahlung. [Theoretical considerations on empirical formulas for counter radiation.] *Zeitschrift für Meteorologie*, 10(10):302-308, Oct. 1956. 5 figs., 9 refs., 15 eqs. DLC—From a consideration of different forms of curves of dependence of counter radiation G on vapor pressure e_0 at earth's surface, author concludes that the best fit is given by $G/\sigma T_0^4 = 0.607 + 0.178 \log e_0$. *Subject Heading: 1. Terrestrial radiation.—C.E.P.B.*

8.6-224

551.521.3:535.33

Ram, Atma and Prasad, S. N. (both, Central Glass and Ceramic Res. Inst., Calcutta), The transmission absorption and reflection of solar radiations by glasses. *Journal of Scientific and Industrial Research*, Sec. A, New Delhi, 14(12):570-584, Dec. 1955. 33 figs., table, 39 refs., eqs. DWB, DLC—Numerous curves are presented to show the absorption, transmission and reflectance of a variety of filters and glasses used for cutting out or admitting radiation in the several color bands of visible, UV and infrared solar radiation, etc. The theory of absorption by chemical in glass, the most used chemicals for obtaining specific absorption or transmission by glass, and several commercial brands of filters of glass and their characteristics, are mentioned. *Subject Headings: 1. Solar radiation transmission 2. Solar radiation absorption 3. Reflectance of glass 4. Light filters.—M.R.*

8.6-225

551.521.4:535.33

Krasovskii, V. I., On the remarks of D. R. Bates and B. L. Moiseiwitsch (1956) regarding the O_3 and O_1^* hypotheses of the excitation of the OH airglow. *Journal of Atmospheric and Terrestrial Physics*, London, 10(1):49-51, Jan. 1957. 16 refs. DWB—Discussion of: Bates, D. R. and Moiseiwitsch, B. L. Origin of the Meinel hydroxyl system in the night airglow. *J. of Atm. Terr. Phys.* 8(6):305-308, June 1956 (see 7.11-190, Nov. 1956, MAB). *Subject Heading: 1. Night airglow spectrum.—C.E.P.B.*

8.6-226

551.521.61:551.508.822

Gergen, John L., Experimental determination of atmospheric infra-red radiation. *Nature*, London, 179(4549):36-37, Jan. 5, 1957. 2 figs., 6 refs. DWB—Since 1954, 372 radiosonde ascents near Minneapolis (45°N) with the new "black ball" total radiation instrument have given consistent averages of air and radiation temperatures. These are plotted for Feb. and Aug. 1956 up to 20 mb. They show that in Feb. the atmosphere is being cooled by radiation at all heights, but in Aug. between 250 and 50 mb it is being warmed. Loss of energy to space is much less than that shown by the Elsasser chart, and a new chart is recommended, as well as radiation data from other latitudes. *Subject Headings: 1. Infrared radiation measurement 2. Radiosonde radiation instruments 3. Minneapolis, Minn.—C.E.P.B.*

8.6-227

621.396:523.74:551.521.64

Allan, A. H.; Crombie, D. D. and Penton, W. A., Long-path V.L.F.-Frequency variations associated with the solar flare of 23 February 1956. *Journal of Atmospheric and Terrestrial Physics*, 10(2):110-113, Feb. 1957. 4 figs., 5 refs. DWB—During solar flare which began at 0331 UT on Feb. 23, apparent frequency of GBR Rugby on 16 kc/s received at Lower Hutt, New Zealand, increased rapidly to a maximum at 0333½, decreased to 0340, increased slightly to 0347 and then returned to normal. This differed from frequency changes during the normal flare of Feb. 10, 1956. The delayed effect following the primary effect is attributed to the cosmic ray burst accompanying the flare. *Subject Headings: 1. Radio wave propagation 2. Solar flares 3. Cosmic ray effects.—C.E.P.B.*

8.6-228

551.521.64:550.38

Marsden, P. L.; Wilson, J. G. and Rose, D. C., **Geomagnetic variations in the cosmic-ray disturbance of 23 February 1956.** *Journal of Atmospheric and Terrestrial Physics*, 10(2):117-119, Feb. 1957. 2 figs., 10 refs. DWB—Response of neutron monitors at N. American stations and Leeds to particles arising from initial disturbance but not sensitive to local time is discussed. Increase at Leeds corresponds to a much lower geomagnetic latitude in N. America. *Subject Headings:* 1. Cosmic ray variations 2. Geomagnetic effects.—C.E.P.B.

8.6-229

551.521.64:551.508.822

Noon, J. H.; Herz, A. J. and O'Brien, B. J., **Relative abundances of different charge groups of heavy primary cosmic-ray nuclei.** *Nature*, London, 179(4550):91, Jan. 12, 1957. 1 table, 7 refs. DWB—Absolute fluxes and relative abundances of light, medium and heavy nuclei are given for a 6 hr balloon flight at 110,000 ft over Texas, and extrapolated to top of atmosphere. Heavy nuclei form a large proportion (0.47 of medium nuclei) and it is suggested that supernovae may be a source of cosmic rays giving a charge distribution with a high proportion of heavy elements. *Subject Headings:* 1. Cosmic ray origin 2. Radiosonde cosmic ray observations.—C.E.P.B.

TEMPERATURE

See also: Temp.-compensated equivalent headwinds (Crossley), 8.6-66; Agromet. evaluation of late spring frosts (Szilágyi), 8.6-90; Design-temp. for heating (Gt. Brit. Ministry of Works), 8.6-97; Cold spell, Jan. 1954 (Suda), 8.6-160; Upper air density and temp. (Bartman et al.), 8.6-172; Integration of heat conduction eq. with periodic temp. variation (de Vries), 8.6-190; Thermal wind (Cunningham), 8.6-199; Solar radiation effects on temp. (Wegener), 8.6-220; Relation between zonal circulation . . . and met. characteristics . . . , France (Gabilly), 8.6-242; Inversion effects on convection (Vehrencamp et al.), 8.6-271.

8.6-230

551.524.3(211.1)

Robbins, Jhan and Robbins, June, **Our weather is changing.** *This Week Magazine* (of Sunday Star), Wash., D. C., Oct. 23, 1955, p. 8-10. illus. photos. DLC—The idea that the climate is warming up in the Polar and temperate regions is supported in this popular illustrated article by evidence from annual temperature records, occasional record breaking hot spells, less freezing weather, glacier and Arctic ice shrinkage, receding tree and snow line, northward movement of birds and agriculture, fish, etc. C. E. P. BROOKS is quoted as saying that a two degree rise in the worlds' mean temperature over 100 year period would melt the whole polar Ice Cap. The author dwells on the consequences to human activity and cautions that it won't come all at once. Causes and effects on jet stream and hurricanes are discussed. *Subject Headings:* 1. Warming of Arctic 2. Climatic changes. I. Brooks, C. E. P.—M.R.

8.6-231

551.524.31:551.524.4

Schneider, Raymond, **Anomalies dans la baisse nocturne de température.** [Anomalies in the nocturnal temperature drop.] *Schweizerische Naturforschende Gesellschaft, Verhandlungen*, 134:113, 1954. DWB, DLC—The results of a detailed study of temperature variations between ground level and 25 m altitude, with the aid of a 6 element recording thermometer are discussed. It has been found that the discontinuities observed after sunset and between 9 and 12 p.m. appear at all levels. From 15 to 30 min before the appearance of the first discontinuity, a strong condensation was observed at ground level; it arises from water vapor of the atmosphere, on the one hand and by transpiration from the ground, on the other. Coinciding with the outset of internal combustion of plants this liberation of energy is sufficient to explain this anomaly. This and other phenomena observed prove that heat exchanges near the ground are much more important than it was admitted before and do not correspond, even during calm nights, with a laminary regime. *Subject Headings:* 1. Nocturnal temperature profiles 2. Nocturnal cooling.—A.M.P.

8.6-232

5515 24.33

Dewey, Edward R., **Dr. Wing's latest cycle discoveries.** *Cycles*, New York, 5(5):165-175, May 1954. 3 figs., 2 tables. Also his: Global pattern of cycles in temperature. *Ibid.*,

6(6):175-179, June/July 1955. 3 figs. **DLC**—World-wide temperature records analyzed by LEONARD W. WING (Foundation for the Study of Cycles) are presented and analyzed. A 4,222-year cycle is identified from over 260 temperature series covering a period of over 40 yrs. The dates of maxima of this cycle are found to progress from both poles to the equator the time of this progression being about 0.7 times the length of the cycle. *Subject Headings*.
1. Temperature periodicities 2. Wing, Leonard W.—G.T.

8.6-233

551.524.35

Rodewald, M., **Das Gegenstück zum Ostsee-Winter 1956/57.** [The counterpart of the Baltic winter 1956/57.] *Wetterlotse*, No. 112:25-28, Feb. 1957. 2 figs. **DLC**—The counterpart of the mild Dec. 1956-Jan. 1957 in the Baltic was abnormally cold weather in Hudson Bay and Labrador in Dec. and the St. Lawrence and Great Lakes in Jan. *Subject Heading*.
1. Temperature anomalies.—C.E.P.B.

8.6-234

551.524.36(439.1)

*Békéssy, Mrs. András, **A fagyos órák gyakorisága Budapesten és Debrecenben.** [Frequency of hours with freezing temperature at Budapest and Debrecen.] *Beszámoló az 1955-ben végzett tudományos kutatásokról* (issued as Hungary. Országos Meteorológiai Intézet, Hivatalos Kiadványai, Vol. 20, pub. 1955), p. 129-136. fig., 4 tables, 7 refs. Russian and German summaries p. 129. **DWB**—To meet needs of the construction industry, the average number of hours with temperature below 0, -5 and -10°C was determined from thermograph data for Budapest (1918-55) and Debrecen (1928-55), for the winter season and by month. In addition to the mean values, characteristics of frequency distribution, such as median, quartile and decile values are also given. From the average number of hours with freezing temperature during a day of freezing, conclusions may be drawn as to their regional distribution. An attempt is made to classify winters in Hungary according to positive or negative deviations from the normal number of hours with freezing temperature during the three winter months. *Subject Headings*: **1. Freezing temperature duration 2. Hungary.—Trans. of author's abstract.**

8.6-235

551.524.36(798)

de Percin, Fernand and Falkowski, Sigmund (both, *Quartermaster Res. and Devel. Center, Mass.*), **Frequencies of selected low temperatures in Alaska.** *Monthly Weather Review*, Wash., D. C., 84(6):207-218, June 1956. 9 figs., 4 tables, 3 refs. **DWB, DLC**—This report presents in detail the frequency of selected low temperatures at 33 stations in Alaska. Daily maximum temperatures at or below 0°F may be expected over 50% of the days in Jan. at interior stations and extreme northern coastal stations, but do not occur at stations exposed to the moderating influence of the ocean. The greatest frequency of maximum temperatures at or below -40°F occurs at Umiat, where 15% of the days in Jan. record this value. Minimum temperatures of -65°F or less are recorded at only four of the interior stations. During July, maximum temperatures at or below 68°F occur least frequently at interior stations (13% of the days at Fort Yukon, 31% of the days at Fairbanks) and 75 to 100% of the time at stations exposed to maritime influence. Daily minimum temperatures at or below 32°F in July are rare at all stations south of the Brooks Range. On the Arctic coast, in July, Barter Island and Barrow have freezing temperatures 39 and 41% of the time, respectively. *Subject Headings*: **1. Temperature frequencies 2. Temperature extremes 3. Alaska.—Authors' abstract.**

8.6-236

551.524.36(495)

Karapiperis, Phōtios P., **Symbolē eis tēn meletēn tēs sykhnotētōs tōn thermōn kai phykhrōn mēnōn en Athēnais (1861-1950).** [Contribution to the study of the frequency of warm and cold months at Athens, 1861-1950.] *Akadēmia Athēnōn, Praktika*, 30:287-291, 1955. 2 tables, 4 refs., 2 eqs. English summary, p. 291. **DLC**—The long period monthly temperature records of Athens are analyzed for the study of the frequency of "warm" and "cold" months (monthly values in excess or defect, respectively, of the monthly normal values over the 90 yrs). From all 1080 months covering the period under consideration, 49.9% had been warm, 49.7% cold and only 0.4% normal. Furthermore, there is a greater tendency towards persistence of warm than cold months. Table I gives the frequency of the warm

and cold months in sequences, while the actual and the computed by Gold's formula "change" distribution of warm or cold months is given in Table II. *Subject Headings:* 1. Temperature frequencies 2. Athens, Greece.—*Author's abstract.*

8.6-237

551.524.36(439.1) 551.521(439.1)

*Péczy, György, A budapesti pentádhőmérsékletek gyakorisági görbéinek vizsgálata. [Study of frequency curves of pentad temperature at Budapest.] *Beszámolók az 1955-ben végzett tudományos kutatásokról* (issued as *Hungary. Országos Meteorológiai Intézet, Hivatalos Kiadványai*, Vol. 20, pub. 1955), p. 173-196. 2 figs., 3 tables, 5 refs., eqs. Russian and French summaries p. 173. DWB—Deviations from normal of pentad temperature are tabulated for each 5-day period from 1851 to July 1955. In a second table the statistical parameters of the pentad temperatures are given (arithmetic mean, variance, standard deviation and probability of normal frequency distribution). A third table contains components of pentad temperature frequency curves. A curve of the annual march of standard deviations of pentad temperature (with 13 marked singularities identified and commented on) and a smoothed curve of annual variations in radiation conditions (Budapest 1851-1950) are presented. *Subject Headings:* 1. Temperature data 2. Radiation data 3. Climate of Hungary 4. Temperature singularities 5. Budapest, Hungary.—*G.T.*

8.6-238

551.524.36:551.501.45

Srinivasan, T. R. (*Met. Office, Poona*), Spells of abnormally cold and hot days at Poona. *Indian Journal of Meteorology and Geophysics, Delhi*, 7(1):43-48, Jan. 1956. 2 figs., 4 tables, 4 refs., eqs. DWB, DLC—A fifty year record of daily maximum temperature during April and May and daily minimum temperatures during the period Dec. and Jan. at Poona is examined with reference to spells of abnormally hot weather in summer and abnormally cold weather in winter. It is found that an empirical relationship of the form $S_x = Ka^x$ holds good, where S_x is the frequency of a particular spell lasting for x days and K and a are the parameters determinable from the data. This provides a means of assessing the chance of occurrence of a spell of particular length. The frequencies were also represented by the logarithmic series $S_x = \sum \beta r^x / x$ where S_x and x have the same notations as referred to above, β and r being determinable from the data. The results obtained by both the geometric series and the logarithmic series are compared and discussed in the paper. *Subject Headings:* 1. Maximum temperatures 2. Minimum temperatures 3. Methods of computation 4. Poona, India.—*Author's abstract.*

SOIL TEMPERATURE

See: *Inst. Permafrostology, Moscow* (Roberts, Armstrong), 8.6-43; *Atmos. temp., solar radiation and soil* (Wegener), 8.6-220.

WATER TEMPERATURE

See also: *Temp. variations, N. Icelandic coast* (Stefánsson), 8.6-72; *Sea surface temp., Iceland* (Stefánsson), 8.6-73; *Test of TB-bathythermographs* (Sabinin, Zalogin), 8.6-76.

8.6-239

551.526.6(261)

Rodewald, Martin, Die nordatlantische Temperaturanomalie in den Jahren 1954 und 1955. 4. Beitrag. [The temperature anomaly in the North Atlantic in 1954 and 1955, 4th contribution.] *Deutsche Hydrographische Zeitschrift*, 9(3):137-142, 1956. 3 figs., 3 tables, 7 refs. German, English and French summaries p. 137. DWB—The positive anomaly of sea temperature in the North Atlantic which was shown earlier to exist in 1951-53 continued in 1954 and 1955. The mean differences from normal at Ocean Weather Ships A-M were 0.45°C in 1954 and 0.54°C in 1955; they were greatest at D, 44°N, 41°W in the northern Gulf Stream (1.46 and 1.32°C). They showed a semiannual wave which was obvious also in 1951-53 and may be due to false normals. The decrease from 0.72°C in 1953 to 0.45°C in 1954 is also shown by the air temperature of eastern North America and Western Europe. (For earlier articles, see 4.2-155, Feb. 1953 and 6.8-244, Aug. 1955, MAB.) *Subject Headings:* 1. Sea temperature variations 2. North Atlantic.—*C.E.P.B.*

8.6-240

535:551.463 551.526.8(52)

Sasaki, Tadayoshi; Okami, Noboru; Watanabe, Seichi and Ōshiba, Gohachirō, *On the vertical distributions of the intensity of illumination in the water and water temperature of Lake Ashinoko. Records of Oceanographic Works in Japan*, Tokyo, n.s., 2(1):57-70, March 1955. 12 figs., 8 tables, 2 refs. DWB—A water-tight illuminometer with high sensitivity and a thermistor thermometer (both constructed in Tokyo laboratory) were used to obtain vertical distribution of intensity of submarine illumination and water temperature in Lake Ashinoko, Hakone. Apparatus are described and illustrated in detail. The chart of the lake shows lines of equal intensity of transparency and location of stations in lake. The relation between water temperature, cloud, wind force, altitude of sun, wave length, plankton and extinction coefficient or illumination at different depths are tabulated and shown graphically and on charts for various parts of the lake. *Subject Headings*: 1. Submarine illumination 2. Lake temperatures 3. Lake Ashinoko, Japan.—M.R.

PRESSURE AND WIND

PRESSURE

See also: Pressure (Hisdal, others), 8.6-22; [Pressure pattern ballistics] (Kelly), 8.6-99; Pressure reduction to sea level (Valkó), 8.6-125; Pressure effect on thermometers (Yajima), 8.6-141; Atmos. densities (Jacchia), 8.6-174; Energy flux in standing waves (Eliassen, Palm), 8.6-193; Lee waves in the stratosphere (Zierep), 8.6-272.

8.6-241

551.541:517.512.2

Mosetti, F., *Analisi periodale applicata ai microbarogrammi*. [Periodic analysis applied to microbarograms.] *Annali di Geofisica*, Rome, 9(2):233-244, April 1956. 4 figs., table. 6 refs., 5 eqs. Italian and English summary p. 243. DLC—We have elaborated with the periodical analysis some microbarograms obtained in a group of tripartite stations. With this mathematical and numerical method it is possible to separate the various components which form the instrumental graphics. They are all the same for period and development of the amplitude in all the three stations of the considered group; the determination of the direction of origin and of the velocity applied to these simple waves is in relation, with improvement to the determination before done on the original diagrams. *Subject Headings*: 1. Periodogram analysis 2. Pressure microvariations.—*Author's abstract*.

8.6-242

551.542.1(261):551.524.35(44)

*Gabilly, A., *Relations entre les anomalies de la circulation zonale sur le proche océan et les caractéristiques météorologiques des hivers et des étés dans le Nord et l'Ouest de la France*. [Relation between zonal circulation anomalies of the nearby ocean and the meteorological characteristics of winters and summers in the north and west of France.] *La Météorologie*, Paris, Ser. 4, No. 37:29-43, Jan./March 1955. 2 figs., 8 tables, 7 refs., eqs. French English and Italian summaries p. 29. DWB—Zonal circulation over the nearby Atlantic is characterized by mean pressure differences between Lisbon and Valencia. The algebraic sums of differences for every month are examined for statistical significance. Results seeming to be significant are examined reciprocally; the algebraic sums of rainfall and temperature variations from normal are then summed up for months and seasons seeming to be connected with anomalies of the pressure gradient. Significant, although loose, connections appear between disturbances in local circulation during some months and the meteorological features of the following summer or winter in Paris or Nantes. *Subject Headings*: 1. Zonal circulation 2. Pressure gradient variations 3. Temperature anomalies 4. France.—A.M.P.

8.6-243

551.543:551.513.7

Schumann, T. E. W., *The spectrum of surface pressure oscillations in the Northern Hemisphere. South Africa. Weather Bureau, Notes*, 5(1):3-11, 1956. 5 figs., 8 tables, 4 refs., 18 eqs. DWB—The daily fluctuation of surface atmospheric pressure at a large number of grid-points in the Northern Hemisphere was analysed and the spectral distribution curve

determined at each individual point. It appears that in all cases the spectral curve, showing the frequencies of different period, can be represented by an analytical expression containing only two parameters whose values at every grid-point could be determined. Also the mean period I_0 , and the period T_m at which the spectral curve attains its maximum were computed for the whole area covered. Charts containing isopleths of T_m and I_0/T_m show that these entities are very markedly influenced by the uneven distribution of land and sea in the Northern Hemisphere. *Subject Heading: 1. Northern Hemisphere pressure oscillations.—Author's abstract.*

8.6-244

551.543:525.6

Spar, Jerome, **The annual meridional tide in the atmosphere.** *Journal of Meteorology*, 14(1):83-85, Feb. 1957. 2 tables, ref., 8 eqs. DWB—An analysis of tidal motions is made by considering deviations of pressure, temperature and zonal motion to be small perturbations from the equilibrium state. It is calculated that pressure in winter reaches a maximum near 40° and minima at pole and equator. (For title from different source, see 4.4-158, April 1953, MAB.) *Subject Heading: 1. Atmospheric tides.—C.E.P.B.*

8.6-245

551.543.5:551.509.324(595)

Sharp, F. A., **Barometric tendency and weather at Changi, Singapore.** *Royal Meteorological Society, Quarterly Journal*, 83(355):112-115, Jan. 1957. 4 tables, 4 refs. DWB—Three-hr tendencies at Singapore corrected for diurnal effect, were studied for Dec. 1954, a very wet month, and for all 1954-55, in relation to rain setting in, increasing or decreasing in following 3 hrs. All tendencies were small and no effect was found on following weather. *Subject Headings: 1. Pressure change effects 2. Singapore.—C.E.P.B.*

WIND AND TURBULENCE

See also: **Dead reckoning in air** (Maya), 8.6-69; **Lower level diffusion computations** (Tank), 8.6-121; **Space-time distribution of atmospheric eddies** (Benton, La Seur), 8.6-194; **Turbulence in convective clouds** (East), 8.6-275.

8.6-246

551.551:533.15

Monin, A. S., **Urvnenie turbulentnoi diffuzii.** [Equations of turbulent diffusion.] *Akademiia Nauk SSSR, Doklady*, 105(2):256-259, Nov. 1955. 4 refs., 12 eqs. DLC—In the classical turbulent diffusion equation of Richardson, the functions $g(l, t)$ (g —density is a function of distance between pairs of particles and t —time) is not suitable for calculations of the concentration q of diffusing mixtures and the recalculations of g to k (coefficient of dispersions) by the method of moments is ineffective. The author therefore develops equations for determining q directly. *Subject Headings: 1. Turbulent diffusion 2. Richardson's diffusion equation.—I.L.D.*

8.6-247

551.551.5:551.557.2:656.7

Clodman, J., **Anisotropic high-level turbulence.** *Royal Meteorological Society, Quarterly Journal*, 83(355):116-120, Jan. 1957. fig., 2 tables, 4 refs. DWB—Upper wind and pressure fields were analyzed for 6 cases of bumpiness varying markedly with direction of flight. Direction of maximum turbulence was found to agree fairly well with contour lines. All cases showed strong horizontal wind shear and it is suggested that turbulence was due to quasi-horizontal gusts associated with this. *Subject Heading: 1. Upper air turbulence.—C.E.P.B.*

8.6-248

551.551.5:629.135

Press, Harry; Schindler, Martin H. and Thompson, James K. (all, Langley Aeronautical Lab., Langley Field, Va.), **Summary of pilots' reports of clear-air turbulence at altitudes above 10,000 feet.** *U. S. National Advisory Committee for Aeronautics, Research Memorandum*, RM L 52L30a, March 24, 1953. 18 p. 5 figs., chart, 5 tables, 3 refs. DWB—As part of a general investigation of the seriousness of the high-altitude clear-air turbulence problem, a program for the collection of pilots' reports of clear-air turbulence encountered in normal civil and military operations was undertaken in 1949. A simple postal-card questionnaire was distributed to groups of civil aircraft operators and selected military units. This paper

presents a summary of the data obtained from this survey together with some additional reports from Air Weather Service reconnaissance flights. In a period of about two years, 443 cases of high-altitude encounters of clear-air turbulence were reported. Of these reports, two-thirds were concerned with turbulence of moderate and severe intensity. These reports indicated that the turbulent areas are patchy with more than half less than 50 mi in horizontal extent and 2000 ft in vertical thickness. Although the frequency of occurrence of turbulence at high altitudes appears to be considerably less than at low altitudes, turbulence at high altitude still appears to occur with sufficient frequency to be a factor in the design and operation of aircraft. *Subject Headings: 1. High level turbulence 2. Pilot reports.—Authors' abstract.*

8.6-249

551.551.8:519.2

Hay, J. S. and Pasquill, F., *Measurements of the short range diffusion of airborne particles at a height of a few hundred feet in the atmosphere.* Porton, England. *Chemical Defence Experimental Establishment, Porton Technical Paper*, No. 561, Aug. 1956. 15 p. 3 figs., 8 tables, 9 refs., eqs. Mimeo. DWB—Lycopodium powder was released for 30 min on 19 occasions from a balloon at a height of 500 ft, and vertical distribution sampled by cylinders at various heights 100, 300 or 500 m downwind. Measurements were also made of mean wind inclination and mean horizontal wind. Frequency distribution of particle elevation and wind inclination are generally similar in shape (Gaussian) and dimensions. The results are interpreted in terms of Lagrangian correlation (between velocities of same particle at two times) and Eulerian correlation (between velocities of air at the same point at two times). An apparent persistence of the former compared with the latter is attributed to a relatively large scale pattern in the eddy structure which changes slowly in time but rapidly as it is carried past a fixed point. Appendices describe sampling technique and "The Eulerian autocorrelation coefficient of the vertical component of eddy velocity." *Subject Headings: 1. Particle diffusion 2. Eddy diffusion 3. Correlation theory.—C.E.P.B.*

WIND DISTRIBUTION AND VARIATION

See also: Climatological normals (Israel Met. Serv.), 8.6-21; *Fog and wind frequency*, Budapest (Hille), 8.6-68; *Wind speed* (Saito), 8.6-118.

8.6-250

551.553:551.588.7(436)

Toperczer, M., *Ein Beitrag zur Struktur des Windes über Wien.* [A contribution to the structure of the wind over Vienna.] *Archiv für Meteorologie, Geophysik und Bioklimatologie. Ser. B*, 8(1):66-74, 1957. fig., table, 2 refs. German, English and French summaries p. 66-67. DWB—For 2 years a pressure tube anemometer was maintained on a roof near the center of Vienna. Readings (v_2) have been compared with those at Hohe Warte on the northern edge of the built-up area (v_1). The directions mostly agree but velocities show great differences. Ratio v_2/v_1 is tabulated for 1-5 . . . 36-40 km/hr for W, N, SE and S winds, summer and winter. In summer (vegetation period) v_2/v_1 approaches 1 (exceeds 1 with SE winds), but in winter is much smaller. *Subject Headings: 1. Wind variations 2. Urban influences 3. Vienna, Austria.—C.E.P.B.*

8.6-251

551.553.1 551.511:533.7

Reshetov, V. D., *K ob"iasneniiu osobennostei sutochnogo khoda vetra v atmosfere.* [Explanation of peculiarities of diurnal variation of wind in the atmosphere.] *Meteorologiya i Gidrologiya*, Leningrad, No. 5:22-23, Sept./Oct. 1955. 4 refs., 6 eqs. DWB, DLC—The author discusses the diurnal wind regime in the lower troposphere and the difficulty in establishing a satisfactory theory of the diurnal wind regime and proposes the following concepts to explain the mechanism of the diurnal wind regime in the atmosphere. Increased turbulence by day leads to increased velocity in the layer near the surface and to a simultaneous rise in the kinetic energy dissipated in the atmosphere. As a consequence, the amount of motion in the free atmosphere is reduced to considerable elevation by day. At night, however, when the dissipation of energy at lower levels is reduced, the arrival of energy from constantly acting factors restores the amount of movement in the free atmosphere. An approximate calculation is carried to support this hypothesis. *Subject Headings: 1. Diurnal wind variations 2. Kinetic energy in atmosphere.—I.L.D.*

8.6-252

551.553.21:551.555(548)

Raghavan, K. (*Met. Office, New Delhi*), **On the strong monsoon winds at Nagercoil.** *Indian Journal of Meteorology and Geophysics*, New Delhi, 6(3):274-276, July 1955. 2+figs., 2 tables, 2 refs. **DLC**—The strength of the upper winds at Nagercoil, Trivandrum and Minicoy was studied quantitatively by analyzing pilot balloon observations taken for the period June–Sept. 1947–51. A table gives the mean wind direction and velocities at 1, 2, 3, 5, 7, 10, 15 and 20 thousand feet for these localities. Maps are presented showing stream line flow of winds in the southwest corner of the Indian peninsula during the southwest monsoon. It is shown that the orography and the resulting deflection of the streamline is the principal cause of the increased wind speed at Nagercoil. *Subject Headings*: 1. Streamlines 2. Monsoon winds 3. Nagercoil, India.—*I.L.D.*

8.6-253

551.553.21:551.515.2

Raman, C. R. V. (*Regional Met. Centre, Bombay*), **Breaks in Indian southwest monsoon and typhoons in southwest Pacific.** *Current Science*, Bangalore, 24(7):219–220, July 1955. Table, 4 refs. **DLC, DWB**—Northward movements of the southwest monsoon with high precipitation along the edge of the Himalayas, ceasing precipitation over the remainder of India and absence of easterly winds in the northern part are called a "break" in the monsoon. Such breaks are closely associated with the crossing of depressions or typhoons into the China Sea north of 30°N. *Subject Headings*: 1. Monsoons 2. Monsoon breaks-typhoon relationships 3. Typhoons 4. India 5. China Sea.—*A.A.*

8.6-254

551.553.6

Schnapauff, W., **Untersuchungen über die Kalmenzone des Atlantischen Ozeans.** [Investigations on the calm zone of the Atlantic Ocean.] *Berlin. Universität. Meteorologisches Institut, Veröffentlichungen*, 2(4), 1937. 35 p. 47 figs., 9 refs. **DLC**—Using aerological balloon ascents made in the Atlantic Ocean between 15°N lat. and 15°S lat., the author calculated the mean distribution of atmospheric pressure, temperature, specific humidity and of temperature gradient. It was found that the zone of calm, lying between northeast and southeast trades, is parallel to the equator aloft although it runs diagonally toward it at the surface. Also both the northeast trade and southeast trade encroach upon each other. The path of air masses on approaching the zone of calm and their curving in the westerlies was followed by means of equivalent potential temperature isolines. The data of mean atmospheric pressure, mean temperature distribution, mean temperature anomalies, mean vertical temperature and profiles of equivalent potential temperature are shown graphically and numerically. *Subject Headings*: 1. Calms 2. Upper air data 3. Atlantic Ocean.—*I.L.D.*

SPECIAL WINDS

See also: **Wind structure in the Trades** (Charnock, others), 8.6-130; **Monsoon winds, Nagercoil** (Raghavan), 8.6-252.

8.6-255

551.555.4(262.3)

Polli, Silvio, **La bora nei golfi di Trieste e Venezia.** [The bora in the gulfs of Trieste and Venice.] *Geofisica e Meteorologia*, Genoa, 4(1/2):11–12, Jan./April 1956. fig., table, refs. **DWB**—The bora is a strong wind which blows from the interior over the Gulf of Trieste. From anemograph records for Trieste, Venice, Treviso, Padua, Chioggia and Rovigo it is shown how the bora propagates across the Gulf of Venice without change in direction, with no lateral spreading and no significant loss in velocity. At the Chioggia on the opposite shore, after having travelled 130 km over the sea, the wind has a velocity reduced by only 30%. *Subject Headings*: 1. Bora 2. Gulf of Venice 3. Adriatic.—*Trans. of author's abstract.*

8.6-256

551.555.6:551.509.317(52)

Kujirai, K., **On the outbreak of the cold air in the third decade of January 1954.** *Journal of Meteorological Research*, Tokyo, 8(4):233–238, June 1956. 15 figs., 2 refs. In Japanese; English summary p. 233. **DWB, DLC**—An analysis of cold air invasion into Japan in the third decade of Jan. 1954, mainly based on 500 mb contours, leads to the following conclusions: (1) Factors favoring cold-air penetration into Japan are: (a) the existence of cold air over the

continent near Japan, (b) deep south-north trough in the vicinity of Japan and northerly or northwesterly air current over Japan. (2) If a trough runs from east to west in the vicinity of Japan, a substantial penetration of cold air into Japan cannot be expected. *Subject Headings: 1. Cold wave forecasting 2. Japan.—Author's abstract.*

8.6-257

551.555.8(426):551.311.3

Spence, M. T., Soil blowing in the Fens in 1956. *Meteorological Magazine*, London 86(1015):21-22, Jan. 1957. 3 photos, ref. DWB—"Blows" in the Fens were less severe in 1956 than on May 4-5, 1955, but occurred on a few days. Photos of that of July 5 are reproduced. They were not associated with drought. *Subject Headings: 1. Wind erosion 2. Sandstorms 3. The Fens, Eng.—C.E.P.B.*

WIND EFFECTS

See also: Calculation of band-width of oceanic swell spectrum (Piest), 8.6-75; Action of variable wind stresses on stratified ocean (Veronis, Stommel), 8.6-78; Change of wind and water regime (L'vovich), 8.6-94; Snow retention with shelter belts (Rakitskil), 8.6-310; Climatic regimes in arid lands (Bhattacharya), 8.6-335.

8.6-258

551.556:551.465:532.59

*Roll, Hans U. (*Seewetteramt, Hamburg*), Die Grösse der Meereswellen in Abhängigkeit von der Windstärke (auf Grund der Wellenbeobachtungen der nordatlantischen Wetter-schiffe). [The dependence of the size of sea waves upon wind intensity (on the basis of wave observations of North Atlantic Weather ships).] *Hamburg. Seewetteramt, Einzelveröffentlichungen*, No. 6, 1954. 62 p. tables, numerous charts. DWB—This study on the dependence of the size of swell and sea waves upon wind intensity is based upon 69,294 complete observations of the height and period of waves and of wind intensity made between Nov. 1950 and July 1953. The discussion covers the following: the working up and presentation of the observational material, the determination of wave steepness, comparison of mean values of the height, period and steepness of waves with theoretical expectations, the frequency distribution of wave magnitudes, regional differences in the North Atlantic and national differences in wave observation techniques. The data presented include mean values of the height, period and steepness of waves for wind strengths 0-12 Beaufort (in graphs), frequency diagrams and mean values of wave magnitudes for wind intensities 3-10 Beaufort (summary of all 10 weather ships), values of wave magnitudes for each of the weather ships, etc. *Subject Headings: 1. Wind waves 2. Ocean wave height 3. Ocean wave generation 4. North Atlantic.—I.L.D.*

8.6-259

551.556:551.578.4

Visser, S. W., De sneeuw op het dak—een puzzle. [Snow on the roof: a puzzle.] *Hemel en Dampkring*, The Hague, 53(7):148, July 1955. DWB, DLC—A snow pattern on roofs of houses in De Biet observed by the author in Feb. 1955 is illustrated with a photograph and a possible explanation in terms of wind action is presented. *Subject Heading: 1. Wind effects on snow.—I.L.D.*

8.6-260

551.556.2

†Akademiia Nauk SSSR, Kompleksnaia Nauchnaia Ekspeditsiia po Voprosam Polezashitnogo Lesorazvedeniia, 1949, *Trudy*, vol. 1, pt. 2. [Transactions of the complex expedition on problems of the cultivation of shelter belts.] Moscow, Izdat. Akademiia Nauk SSSR, 1951. 401 p. figs., tables, bibliogs. throughout. DLC—A collection of reports on the results of the work done 1) by two parties (northern and southern) investigating the influence of shelter belts on the change of natural conditions (climatic, soil, hydrologic, etc.) and on the improvement of the productivity of farm lands in areas protected by shelter belts, 2) of parties assigned special tasks such as (a) determination of principles for the selection of plots for the cultivation of commercial oak groves; (b) study of the geological structure, the hydro-geological conditions, and the lakes and ponds of the black earth belt of European U.S.S.R. and 3) soil erosion investigations. A special section of the book contains summaries on other scientific questions as: (a) general questions of geomorphology in the work of the

xpedition; (b) basic questions of hydro-geology connected with the problem of forest cultivation in steppes and (c) geobotanical and geological investigations, etc. *Subject Headings:* 1. Shelter belts 2. Shelter belt effects. I. Sukachev, V. N. (ed.) II. Pravdin, L. F. (ed.). —A.M.P.

8.6-261

551.556.2:634.94

Markov, K. K. and Lidov, V. P. (*Moscow Univ.*), Otriad po izucheniiu territorii kolchoznykh polezashchitnykh lesnykh polos: mezhdru rekami Donom i Khoprom. [Committee for investigating collective farm lands with forest shelter belts: between Don and Khoper Rivers.] (In: *Akademiia Nauk SSSR. Kompleksnaia Nauchnaia Ekspeditsiia po Voprosam Polezashchitnogo Lesorazveniiia*, 1949, *Trudy* Vol. 1, Pt. 2. Moscow, Izdat. Akademiia Nauk SSSR, 1951. p. 120-139. fig.) **DLC**—A report on the results of a comprehensive study of natural and economic conditions of already existing kolkhoz shelter belts and of a study of the experience gained by the sovkhozes and kolkhozes in shelter belt cultivation. The study was carried out for the purpose of developing, on the basis of results, general rules and recommendations for the further cultivation of shelter belts in Voronezh and Tambov provinces. The study consists of paleographical, historical, geographical, geomorphological, hydrological, geo-botanical and climatological investigations. The climatological investigations, directed by ALISOV, led to the following conclusions: 1) The change in the regime of the basic meteorological elements in the lowest air layer is mainly caused by changes in wind speed. 2) The effectiveness of shelter belts depends mainly on their structure and height, increase with increase of wind speed and the approximation of the angle between wind direction and the belt alignment to 90°. 3) Fretted shelter belts of maximum height are the most effective in reducing wind speeds. 4) Microclimatic investigations indicate that the most desirable shape of interbelt space is a space with sides 500 m long. *Subject Headings:* 1. Forest shelter belts 2. Shelter belt effects 3. U.S.S.R. I. Alisov, B. P. II. Apollov, B. A. III. Kosov, B. F. IV. Saushkin, I. U. G.—A.M.P.

8.6-262

551.556.2(497.2) 551.506:551.584

*Struška, Vladimír and Uhlíř, Pavel, *Měření na větrolamech v Bulharsku*. [Measurements on shelter belts in Bulgaria.] *Meteorologické Zprávy*, Prague, 5(3):62-74, 1952. 28 figs., 5 refs. **DLC**—The purpose of the study reported in this paper was to determine the effect of shelter belts at various wind directions and the permeability of various types of belts. Measurements were made in a dense micrometeorological network in and outside a space enclosed by various types of belts. The (horizontal and vertical) arrangement of instruments is discussed in detail and shown in diagrams. The values measured were wind speed and direction, evaporation, temperature, dew, and humidity of air and soil. Preliminary data are presented in diagrams on wind speed and evaporation for three types of shelter belts. *Subject Headings:* 1. Shelter belts 2. Micrometeorological observations 3. Bulgaria. G.T.

UPPER AIR WINDS

See also: Planetary jet stream models (Freeman), 8.6-2; Wind fields near tropopause (Texas. Agr. Mech. College), 8.6-5; Climatological normals (Israel Met. Serv.), 8.6-21; Atmospheric pollution trajectory studies (Neiburger), 8.6-27; Temp-compensated equivalent headwinds (Crossley), 8.6-66; Streamline analysis (Sherman), 8.6-124; Drift of E layer (Harang, Pedersen), 8.6-182; Thermal wind near jet stream (Cunningham), 8.6-199; Small scale disturbances in jet stream (Kasahara), 8.6-201; Easterly jet stream (Koteswaran), 8.6-202; Jet stream (Rodríguez Franco), 8.6-204; Anisotropic high-level turbulence (Clodman), 8.6-247.

8.6-263

551.557:551.513(54)

Mooley, D. A. (*Regional Met. Centre, New Delhi*), Zonal wind circulation and vertical temperature distribution along the Indian longitudes during the monsoon and winter seasons. *Indian Journal of Meteorology and Geophysics*, Delhi, 7(2):113-128, April 1956. 6 figs., 10 tables, 16 refs. **DWB, DLC**—The study is based on all the available wind and temperature data for 1944-49. Sections of geostrophic zonal wind and temperature and of observed zonal winds have been prepared. Frequencies of strong winds (speed 70 kn or more) along the

section have been worked out for the different latitudes. The chief features of the monsoon sections are: (1) Generally small latitudinal temperature variation up to 300 mb level and an appreciable variation at 200 mb and 150 mb levels in Madras-Nagpur and Nagpur-Jodhpur sectors, (2) Strong easterly winds south of 15°N at 14 km and above. The chief features of the winter sections are: (1) An appreciable latitudinal temperature gradient between Poona and Peshawar up to 400 mb level and reversal of gradient above 200 mb level as observed by others, (2) Strongest zonal (west) wind near 23°N and a secondary wind maximum apparently near 30°N and (3) A fairly high frequency of strong winds between 21° and 31°N. From a consideration of the frequency of high winds, a well-marked jet south of 20°N seems unlikely. A comparative study of the various mean sections indicates that during winter, jets in the Northern Hemisphere are found over a much wider latitudinal belt than in the Southern Hemisphere and during summer, the westerly jets in Northern Hemisphere are much weaker than those in the Southern Hemisphere. *Subject Headings:* 1. Atmospheric circulation 2. Upper air winds 3. India.—*Author's abstract.*

8.6-264

551.557:551.513.2

Ramamurthi, K. M. (*Met. Office, New Delhi*), A "jet stream" over northern India as revealed by a "Comet" debriefing report. *Indian Journal of Meteorology and Geophysics*, New Delhi, 6(3):277-278, July 1955. 2 figs. **DLC**—The author presents an analysis of radiosonde ascents made at all stations in India at 1500 GMT on the same day on which a "Comet" debriefing report for the Calcutta-Delhi route (1025 to 1252 GMT, 28 Dec. 1952) indicated that a wind speed of 150 kn and severe turbulence was experienced during the cruise. A cross section at 1500 GMT on Dec. 28, 1952 along long. 84°E and the 200 mb contour chart at 1500 GMT Dec. 28, 1952 are presented. *Subject Headings:* 1. Jet stream analysis 2. Atmospheric turbulence 3. India.—*I.L.D.*

8.6-265

551.557.3:551.513.2(764)

Cunningham, N. W., The frequency distribution of high velocity wind currents over Texas. Texas. Agricultural and Mechanical College, Dept. of Oceanography, Contract AF 19(604)-559, Scientific Report No. 9, Aug. 1956. 18 p. 6 figs., 3 tables, 6 refs.—Results obtained in a preliminary statistical investigation of jet stream winds over the southwestern U. S. are discussed. It is presented partly as a reply to erroneous statements in the press and on the radio implying the regular occurrence of 300-400 mi/hr jet streams over northern Mexico and the southern tier of states. A frequency distribution of wind speeds at 35,000 ft, from daily observations at 0300 and 1500 GCT, is presented for three Air Force stations within the Texas area covering the period Nov. 1953-April 1954 and Nov. 1954-April 1955. The distribution of wind speed and direction is also considered from the standpoint of equipment used by both the Weather Bureau and the Air Force. Since the Air Force instrument is capable of operating to lower elevation angles and thus for stronger winds aloft, the discussion is restricted to the data obtained from the AN/GMD-1A rawin instrument. *Subject Headings:* 1. Upper air wind variations 2. Jet stream 3. Texas.—*Author's abstract.*

8.6-266

551.557.3:551.509.59

Roy, A. K. and Rai Sircar, N. C. (*Met. Office, Poona*), On the utility of plotting vectorial changes of upper winds in forecasting developments and progress of important pressure systems. *Indian Journal of Meteorology and Geophysics*, Delhi, 6(2):97-118, April 1955. 6 figs., 3 refs. **DWB, DLC**—The authors discuss the advantages of plotting vectorial changes of upper winds over surface pressure tendencies for forecasting the formation of depressions in the sea areas of India and present specific examples showing the usefulness of daily vectorial changes of the upper winds: (1) in forecasting more accurately, depressions and cyclonic storms in the Bay of Bengal, (2) exact location of western disturbances and detection of the secondaries induced by them and (3) in forecasting upper winds, changes and convective showers. *Subject Headings:* 1. Upper air wind vectors 2. Pressure forecasting 3. Atmospheric disturbances 4. Bay of Bengal.—*I.L.D.*

8.6-267

551.557.32:551.587(521.22)

Kawamura, A., Monthly mean winds aloft over Tateno in 1950 through 1953. *Journal of Meteorological Research*, Tokyo, 8(1):8-19, March 1956. 6 figs., 11 tables, 4 refs. In

Japanese; English summary p. 8. **DWB, DLC** Using aerological data at the Tateno Aerological Observatory from 1950 through 1953, the vertical distribution and annual variation of monthly mean winds aloft are investigated statistically, viz., mean W E and S N components and the resultant wind directions as well as the mean scalar wind speed. The annual and vertical variations are analyzed by means of harmonic analysis. It appears that changes of wind parameters undergo a marked shift at tropopause height. *Subject Headings: 1. Upper air wind variations 2. Tateno, Japan.—From author's abstract.*

8.6-268

551.557.36

Crutcher, Harold L., **On the standard vector-deviation wind rose.** *Journal of Meteorology*, 14(1):28-33, Feb. 1957. 5 figs., table, 13 refs., 5 eqs. **DWB** The standard vector-deviation (SVD) wind rose depicts the wind and its variation. Circular distributions are first described, e.g., Charleston 300 mb Dec.-Feb. Review of 1000 seasonal upper wind distributions 1948-53 showed that $\frac{1}{2}$ over maritime and $\frac{1}{3}$ over continental areas are elliptical and may be constructed from vector mean, standard deviations of latitudinal and meridional components, and correlation between them, e.g., Omaha 300 mb Dec.-Feb. *Subject Heading: 1. Upper air wind roses.—C.E.P.B.*

VERTICAL MOTION

See also: Energy flux in standing waves (Eliassen, Palm), 8.6-193; *Turbulence in convective clouds* (East), 8.6-275; *Wave clouds, Isle of Man* (Kavanagh), 8.6-288.

8.6-269

551.558:551.511.6:551.515.11

§Fisher, Edwin L., **Vertical motion and cyclogenesis.** New York Univ. College of Engineering. Research Div. Dept. of Meteorology and Oceanography, Contract Nonr-285(09), Technical Paper, No. 6, March 1956. 30 p. 7 figs., 10 refs. **DWB**—The fields of vertical motion in two east coast cyclones (Dec. 9-11, 1952 and Nov. 6-7, 1953) are examined and compared with the fields of vertical motion computed by other investigators. It is found that there is a definite pattern of rising and sinking motion associated with each of the cyclones. The generation of cyclonic vorticity in the cyclones is associated with convergence in the upper portions of the sinking column. Certain other auxiliary effects of the vertical motions are also explored. For example, it is suggested that the development of a double tropopause is caused by the sinking motion, and it is also thought that the vertical motions tend to increase the potential energy in the cyclone. *Subject Headings: 1. Vertical motion 2. Cyclogenesis 3. Cyclonic vorticity.—Author's abstract.*

8.6-270

551.558:551.576.11

Moore, C. B.; Smith, J. R. and Church, D. A., **Comments on (B. Vonnegut; J. S. Malkus; H. Byers, and R. R. Braham): Downdrafts in cumulus clouds.** Reply by Joanne Malkus. *Journal of Meteorology*, 14(1):87-88, Feb. 1957. 2 figs., 6 refs. **DWB**—Commenting on correspondence (*J. of Met.*, 12(5):508-510, Oct. 1955; see 7.3-213, March 1956, *MAB*) on papers by MALKUS and by BYERS and BRAHAM, authors give observations of downdrafts indicated by a balloon just ahead of a thunderstorm. References are quoted from *MAB* to downdrafts in clear air outside cumuliform clouds. Observations with a controlled neutrally stable balloon are suggested. MALKUS comments that all clouds studied so far showed downdrafts but further evidence is desirable. *Subject Headings: 1. Cumulus clouds 2. Downdrafts in cumulus clouds.—C.E.P.B.*

8.6-271

551.558.1:551.511:551.524.4

Vehrencamp, J. E.; Ambrosio, A. and Roumie, F. E., **Convection from heated sources in an inversion layer.** California. Univ. Dept. of Engineering, First Report of Air Pollution Studies, (last article), June 30, 1955. 39 p. 15 figs. (incl. photos), 11 refs., 30 eqs. **DWB**—The theory of convective columns produced by local heat sources is reviewed and field experiments made on the Mojave Desert, Calif., are described and illustrated. Oil fires of various sizes were used to test the theory. Moving picture cameras were set up at 2 sites to view the smoke columns from various angles. Temperature measurements were made to top of inversion to help in analysis. It was found that the column rises considerably higher than theoretically possible, especially when larger fires are set, but in no case would the column

reach the top of a subsidence inversion. Slight winds produce great effect on column by producing horizontal inclination or even a sharp break in vertical motion. The size of the fire would need to be increased 16 times to double the height of the column. (*Same item as 7F-213, June 1956, MAB.*) *Subject Headings:* 1. Convective columns 2. Inversion effects on convection 3. Heat source convection 4. Mojave Desert, Calif.—*M.R.*

8.6-272

551.558.21:551.541

Zierep, J., *Das Verhalten der Leewellen in der Stratosphäre.* [Behavior of lee waves in the stratosphere.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 29(1):10-20, 1956. 2 figs., 7 refs., numerous eqs. German, English and French summaries p. 10. DWB—The equation for lee waves in the troposphere and stratosphere is solved, and the boundary conditions are satisfied at the ground and at the tropopause, the latter being regarded as an internal surface of discontinuity. In the stratosphere the lee waves are the result of the superposition of two basically different wave types: The first type decreases exponentially with z , the second type varies periodically with z . This last type is discussed in detail. *Subject Headings:* 1. Lee waves in the stratosphere 2. Lee wave equation.—*Author's abstract.*

AQUEOUS VAPOR, HYDROMETEORS AND HYDROMETEOROLOGY

HUMIDITY

See: Modification of the wind and water regime (L'vovich), 8.6-94; *Water and micro-organisms* (Miller, Clark), 8.6-108; *Humidity obs. in high mts.* (Vorob'ev), 8.6-114; *Dry and wet bulb temp.* (Vilkner), 8.6-116; *Nomogram for psychrometric calculations* (Belinskii), 8.6-123; *Humidity measurements, Europe* (Hooper), 8.6-142; *Thunderstorm-vapor pressure relationships, Prague* (Rein), 8.6-211.

EVAPORATION

See also: Evaporation measurement (Robertson), 8.6-112; *Moisture of continents* (Budyko), 8.6-115.

8.6-273

551.573:581.11

Hesse, W. (*Inst. für Agrarmet., Leipzig Univ.*), *Der Wasserhaushalt von Kulturpflanzen.* [The water economy of cultivated plants.] *Geofisica Pura e Applicata*, Milan, 34:253-259, 1956. 3 figs. (incl. photo), 20 refs., 2 eqs. German and English summaries, p. 253. DLC—The water budget of cultivated plants is very complicated and liable to the influence of numerous environmental factors. Many methods have already been developed by meteorologists for the study of the evaporation. During the growing periods of 1950, 1953, 1954 and 1955 investigators in Leipzig used a newly developed, small lysimeter (of glass) and from 1954 on a measuring arrangement containing 6 small lysimeters (gauze lysimeters) of a different kind as well as a transpirograph. By means of the lysimeter installation it was possible to determine all components of the equation of the water balance and to draw conclusions regarding the complete water budget of the plants. Numerous measurements with six repetitions for each of them showed valuable results which are of great importance for agriculture, applied botany, etc. *Subject Headings:* 1. Evapotranspiration 2. Lysimeter observations 3. Plant water economy.—*Author's abstract.*

CONDENSATION

See also: Induced precip. (Bowen), 8.6-165; *Artificial rainfall control, Kongwa* (Davies et al.), 8.6-167; *Rainmaking*, 8.6-170; *International classification for snow*, 8.6-305.

8.6-274

551.574.1

Bider, Max (*Basel*), *Ergebnisse eineinhalbjähriger Registrierungen der Anzahl der Kondensationskerne in Basel.* [Results of one and a half-year recording of the number of

condensation nuclei at Basel.] *Schweizerische Naturforschende Gesellschaft, Verhandlungen*, 34:115-116, 1954. DWB, DLC—The results of the continuous recording of condensation nuclei (Jan. 1953-June 1954) carried out by the Astronomic and Meteorological establishment in Basel are presented and discussed. It is shown that: the mean seasonal number of condensation nuclei was unexpectedly the highest in summer (4900 against 3600 and 3000 in the other seasons); that the daily variations shows a maximum between 9 and 12 a.m. and at sunset; that at least a part of the nuclei arise from waste gases of the city of Basel; and that there is an increase of nuclei during N and NE winds, as well as in the presence of a continental air supply. *Subject Headings: 1. Condensation nuclei variations 2. Basel, Switzerland.*—A.M.P.

8.6-275

551.574.1:551.511.6:551.551.5:551.558.1

East, T. W. R., **The intensity of turbulence in convective clouds.** *Royal Meteorological Society, Quarterly Journal*, 83(355):121-126, Jan. 1957. 3 figs., table, 11 refs., 12 eqs. DWB—Calculations of collision rates between cloud droplets in turbulent air show that this would be an effective precipitation mechanism in cumulus if the r.m.s. turbulent acceleration were about 10 times that due to gravity. An estimated value, based on published records of flights through thunderstorms, is about one-sixth of gravity. In the absence of more direct evidence, it seems that turbulence is not an important factor in convective precipitation. *Subject Heading: 1. Turbulence in clouds.*—Author's abstract.

8.6-276

551.574.1:551.576 551.591:551.576

Eldridge, Ralph G., **Measurements of cloud drop-size distributions.** *Journal of Meteorology*, 14(1):55-59, Feb. 1957. 4 tables, 20 refs., 3 eqs. DWB—Drop-size distributions in 10 natural clouds on Mt. Washington were inferred from transmission measurements with a variable-frequency infrared spectrophotometer. Data are tabulated as number of drops per cc and liquid water content per 2- μ diameter class width. The distribution is bimodal; the 1 and 3 μ diameter classes contribute most droplets but a negligible amount of liquid water, and there is another maximum generally at 11-15 μ . Visual ranges computed from the drop-size distribution and scattering coefficient agree with observed visibility. The role of the smaller droplets in limiting visibility is important. *Subject Headings: 1. Cloud drop size distribution 2. Visibility in clouds.*—C.E.P.B.

8.6-277

551.574.1:551.594.12/3

Nolan, P. J. and O'Connor, T. C. (both, Univ. College, Dublin), **Size, mobility and charge of multiple charged ions.** *Royal Irish Academy, Proceedings, Sec. A*, 57(10):161-171, 1955. 10 refs. DLC, DWB—Ions were produced by bubbling filtered air through distilled water by use of an electrically driven rotary pump. The optimum size of orifice was first determined, then the bubbling pressure and rate of production of nuclei, the average size of the nuclei, the ratio of total nuclei to uncharged nuclei, the equilibrium charge distribution, mobility of ions, diffusion coefficient and charge and their interrelationships. Finally, a new theory of "ballo-electricity," or for the origin of charges produced by splashing, spraying or bubbling of liquids is discussed in the light of the measurements. Radii range from 0.7×10^{-6} cm or fast ions to 2.7×10^{-6} cm for slow ions which puts them definitely in the size range of ions, not droplets. Average charge is 23 (range 127 to 7) ionic charges. Over 90% of nuclei are charged at first. *Subject Headings: 1. Ion charges 2. Ion mobility 3. Ballo-electricity 4. Nuclei from splashing.*—M.R.

8.6-278

551.574.1

Oddie, B. C. V., **Atmospheric nuclei. An estimate of the value and practicability of routine measurements.** *Great Britain. Meteorological Research Committee, M.R.P.*, 1012, 31 Oct. 1956. 8 p. 2 figs., 11 refs. Mimeo. DWB—Counting of dust particles by Owens dust counter or of Aitken condensation nuclei seems unlikely to contribute much to other branches of meteorology, though counting Aitken nuclei at a few places might be useful. Counts of freezing nuclei under natural conditions would be valuable but are difficult. Objectives are set out; none of the methods yet tried satisfy them but CWILONG's threshold temperature

method and E. K. BIGG's new type of cloud chamber deserve further study. *Subject Headings:*

1. Nuclei counter 2. Freezing nuclei.—*C.E.P.B.*

8.6-279

551.574.1:551.576.1

Schotland, R. M., and Kaplin, E. J., **The collision efficiency of cloud droplets.** New York Univ. College of Engineering, Research Div., Contract AF 19(604)-993, Scientific Report, No. 1, April 1956. 34 p. numerous figs. (incl. photos), 7 refs., 8 eqs. **DWB**—An experimental determination by a modeling technique has been made of the collision efficiencies of water drops. Collision efficiency curves are presented for simulated 11, 14, 17, and 21 micron diameter cloud drops with respect to a range of smaller cloud drops. Examples are shown of the trajectories of pairs of falling drops. Relative trajectories of small drop about the larger overtaking drop are presented. *Subject Headings:* 1. Cloud droplets 2. Droplet coagulation.—*Authors' abstract.*

8.6-280

551.574.1:551.594.12

Siksna, R. (*Uppsala Univ., Sweden*), **Charged condensation nuclei formed in a room by corona discharge when alternating the polarity of the corona potential and by using alternating corona potential.** *Geofisica Pura e Applicata*, Milan, 31:39-49, May/Aug. 1955. 8 figs., 11 refs. English and German summaries p. 39. **DWB, DLC**—The content of charged nuclei formed in a room varied by alternating the polarity of a corona device and depended on the period during which the corona of one polarity was switched on. The concentration of charges measured was greater during the negative period than during the positive one, when the action period of corona of one polarity was 30 min, but it was the opposite for the period of 5 min. When using alternating corona potential of 50 cycles/sec only positively charged nuclei were established. By using alternating potential the picture was changed when air was blown through the corona device: the content of positively charged nuclei was diminished and negatively charged nuclei were also observed. An air circulation produced by the convection from an electric heater placed below the corona device was sufficient to cause a similar effect. *Subject Headings:* 1. Charged nuclei 2. Uncharged nuclei 3. Corona discharges.—*Author's abstract.*

8.6-281

551.574.1

Some aspects of the microphysics of cloud. *Meteorological Magazine*, London, 86(1016): 50-55, Feb. 1957. 8 refs. **DWB**—Discussion on Oct. 22, 1956, was opened by W. G. DURBIN, who began with basic theory of growth of cloud droplets. Hygroscopic nuclei which are believed to promote growth are either salt particles, or drops of sulfuric and nitrous acid. He then described nuclei counting instruments and an aluminum foil method of counting drops. The ice phase was next considered, precipitation mechanisms and artificial stimulation of precipitation reviewed. A general discussion followed. *Subject Headings:* 1. Cloud physics. **I. Durbin, W. G.**—*C.E.P.B.*

8.6-282

551.574.2:546.41:546.264

Manson, James E., **Calcium carbonate as an ice nucleus.** *Journal of Meteorology*, 14(1):85-86, Feb. 1957. 4 refs. **DWB**—The vaterite form of CaCO_3 acts as a freezing nucleus at -15°C whereas calcite does not, due to a difference in structure. Vaterite has a life-time of at least a week before changing to calcite. *Subject Headings:* 1. Freezing nuclei 2. Vaterite.—*C.E.P.B.*

8.6-283

551.574.7:629.13

*Perkins, Porter J., **Statistical survey of icing data measured on scheduled airline flights over the United States and Canada from Nov. 1951 to June 1952.** *U. S. NACA, Research Memorandum*, E55F28a, Sept. 8, 1955. 44 p. 18 figs. (incl. photos), 2 tables, 8 refs. **DWB**—About 600 icing encounters, analyzed in this report, occurred on the New York to San Francisco, Miami to Maine, Los Angeles to Seattle, Seattle to Fairbanks, and Vancouver to Montreal routes and were recorded by flight crews of United, Eastern, Northwest, Trans-Canada and Pan American airlines between Nov. 1951 and June 1952. An icing rate meter was installed in each aircraft (DC-3, DC-4, Convair 240, Constellation and North Star), and data on altitude, rate of icing, air speed, vertical extent of icing, temperature, liquid water content, and total

ce accumulation were recorded or calculated. Conditions during each encounter are tabulated in detail, and length, altitude, range, etc. graphed and discussed in text. Over half of the cases were intermittent, and 10°C . exceeded 120 mi (one 430 mi in extent. Maximum thickness was 6". *Subject Headings:* 1. Icing of aircraft 2. Aeronautical meteorology. *M.R.*

FOG

See also: Fog and wind frequency, Budapest (Hille), 8.6-68.

8.6-284

551.575.2(439.1)

*Kakas, József and Otta, Mrs. Endre, A köd gyakorisága Magyarországon. [Frequency of fog in Hungary.] *Beszámolók az 1955-ben végzett tudományos kutatásokról* (issued as *Hungary. Országos Meteorológiai Intézet, Hivatalos Kiadványai*, Vol. 20, pub. 1955), p. 152-165. 3 figs., table, 16 refs. Russian and German summaries p. 152. DWB—Three maps prepared from fog observations at 136 stations throughout Hungary (1940-1954) show the number of days with fog for the year, for the winter season and for Dec. (during this foggiest month of the year 20-25% of all days with fog occur in Hungary). Monthly and seasonal average fog frequencies are also tabulated for longer periods for Budapest (1871-1905 and 1932-33), Turkeve (1892-1901 and 1932-33) and Debrecen (1901-1934). *Subject Headings:* 1. Fog distribution 2. Hungary.—*G.T.*

8.6-285

551.575.213(521.73)

Uchida, T.; Miyake, T.; Nakamura, H. and Tobita, T., Fog in the vicinity of Kyoto. *Journal of Meteorological Research*, Tokyo, 7(5):323-325, July 1955. 4 figs., 2 tables. In Japanese. DWB—Local frequency of fog in various parts of Kyoto and vicinity shown on a number of isarithm charts of area for different periods of $\frac{1}{2}$ hour (5:30-8:30 a.m.) or for hours of day (0130-0900) based on data for 1952-53. Monthly frequency for period 1943-1952 is tabulated (91 cases). *Subject Headings:* 1. Fog studies 2. Fog frequencies 3. Kyoto, Japan.—*M.R.*

CLOUDS

See also: Downdrafts in cumulus clouds (Moore et al.), 8.6-270; *Cloud drop size distribution* (Eldridge), 8.6-276; *Cloud droplets* (Schotland, Kaplan), 8.6-279; *Heavy rain-fall and interesting clouds* (King), 8.6-300; *Cloud height-visibility relationships* (Reshehikova, Tonkova), 8.6-344; *Convective cloud electrification* (Fitzgerald), 8.6-357.

8.6-286

551.576:535.36

Richards, Paul I. (*Technical Operations, Inc., Arlington, Mass.*), Scattering from a point source in plane clouds. *Optical Society of America, Journal*, 46(11):927-934, Nov. 1956. 3 figs., numerous eqs. DWB, DLC—A previously proposed modified form of diffusion theory is applied to problems involving point sources and plane clouds over an absorbing ground. A general but formal solution is first presented. Some analytic results are then obtained for a point source at the edge of a semi-infinite (half-space) cloud; specific formulas are given for the photon density at the edge of the cloud and for the net photon current there; asymptotic results are obtained for large distances inside the cloud along the source axis. Finally, numerical results are presented for the photon density at the mid-plane of an infinite plane cloud with thickness equal to two (transport) mean free paths and a point source at the center. An appendix summarizes analytic results of the modified theory for: a point source in an infinite medium, a point source at the center of a finite sphere, the albedo and transmission of an infinite plane slab with parallel ("solar") illumination at an arbitrary angle, the albedo of the combination of a plane cloud over a ground plane with arbitrary albedo, and a rough analysis of ambient light levels in the ocean. *Subject Heading:* 1. Light diffusion by clouds.—*Author's abstract.*

8.6-287

551.576.1:551.506.7

James, D. G., Investigations relating to cirrus cloud. *Meteorological Magazine, London*, 86(1015):1-12, Jan. 1957. 7 figs., 11 tables, 9 refs. DWB—Airplane reports (220) of cirrus

cloud in British region 1952-54 are analyzed. There were 29 cases of cloud top above tropopause, 10 by >6000 ft, but maximum was 0-4000 ft below. Bases were mostly at 20,000-32,000 ft, 4000-14,000 ft below tropopause, thickness mainly up to 6000 ft. Dew point depression was 17-18°F with cirrus, 25-26°F without; lapse rates were not significantly different. Winds at 200-400 mb show maximum Ci with S-W winds, (minimum with S-E), with warm air advection, near a thermal ridge, when curvature of isotherms shown by thickness lines is anticyclonic, and with cyclonic vorticity positive in the troposphere, negative in the stratosphere. Ci was most frequent near jet stream axis. (For abstract on this title from different source, see 7.5-100, May 1956, *MAB*.) *Subject Headings*: 1. Cirrus clouds 2. Airplane observations.—*C.E.P.B.*

8.6-288

551.576.1:551.558.21

Kavanagh, W. H., *Wave clouds over the Isle of Man*. *Meteorological Magazine*, London, 86(1016):46-50, Feb. 1957. 4 figs., 2 photos., 3 refs. DWB—Hills in Isle of Man rise to 1400-1500 ft. Most favorable conditions for wave clouds are a NW air stream with a stable layer or inversion in first few thousand feet and a positive wind shear. Two cases are shown by tephigram (at Aldergrove). Profile of SCORER's P^2 is shown. *Subject Headings*: 1. Wave clouds 2. Isle of Man.—*C.E.P.B.*

8.6-289

551.576.11

Tschirhart, G., *Remarques sur le mécanisme du cumulonimbus et applications diverses en météorologie*. [The cumulonimbus mechanism and various applications in meteorology.] *La Météorologie*, Paris, Ser. 4, No. 40:301-311, Oct./Dec. 1955. 14 figs., 2 eqs. English and Spanish summaries p. 301. DWB—Observations made at Fort-Lamy, Chad, Africa, in connection with precipitating cumulonimbus development during the rainy seasons of 1953 and 1954 are summed up. Vertical wind distribution, surface wind, pressure and temperature and their variations, ascending, descending and diverging currents and other characteristics of the cumulonimbus and mechanism are described. Connections of cumulonimbus formation with cold and warm fronts and various upper air conditions are indicated. *Subject Headings*: 1. Cumulonimbus development 2. Wind variations 3. Fronts 4. Fort Lamy, Fr. Equatorial Africa.—*G.T.*

8.6-290

551.576.4:551.506.7(54)

Pramanik, S. K. and Koteswaram, P. (*Met. Off., Poona*), *Heights of tops of low clouds over India*. (In Symposium on Artificial Rain, New Delhi, Feb. 1953, *Proceedings and Papers*, pub. 1955. p. 104-111. 16 figs., table, 3 refs.) DWB—From all available aircraft reports during the years 1948-1951, frequencies of occurrence of low cloud tops in various ranges of heights have been worked out for different 5-degree squares in the country. It is found that more than 90% of the reported heights of low cloud tops lie below the freezing level during the year, the percentage frequency reaching above freezing level being least in the S.W. monsoon season and highest in summer. The heights of tops of low clouds in different parts of the country in different seasons are discussed in relation to the techniques suitable for cloud seeding experiments. *Subject Headings*: 1. Cloud top heights 2. Airplane observations 3. India.—*Authors' abstract.*

PRECIPITATION

See also: **Flood control in Asia** (United Nations. Econ. Commiss. for Asia and Far East), 8.6-6; **Great Plains** (Weaver, Albertson), 8.6-14; **Rainfall analysis, Manila** (Estoque), 8.6-119; **Upper limits of variability** (Katsnelson, Kotz), 8.6-120; **Graphic presentation of rainfall** (Balseinte), 8.6-122; **Artificial and orographic rainfall stimulation** (Ramage, Bell), 8.6-169; **Hurricane rainfall** (Gilbert, La Seur), 8.6-209; **Rain infiltration of soil** (Musgrave), 8.6-319.

8.6-291

551.577:551.506(548)

*Ramakrishnan, K. P. and Naraynan, J., *Study of fifty years' rainfall of Mangalore, India*. *Meteorological Dept., Memoirs*, 30(3):101-153, 1955. 10 figs., numerous tables, 3 refs. DWB—Rainfall data for 1901-1950 for Mangalore on the west coast of India are

analyzed statistically in detail. The average annual rainfall is 134". The studies are similar to those for Madras (see 6.1-265, Jan. 1955, *MAB*) and for Nagapattinam (see 5.8-202, Aug. 1954, *MAB*). The exposure is good and the gage about $\frac{1}{2}$ mi from the sea. The highest daily normal was 1.78" on June 14, the height of the southwest monsoon. The rainy season lasts from June 1 to Sept. 1 (76% of annual total). Three-day normals and 3-day moving normals were calculated, as well as $\frac{1}{2}$ monthly means, monthly means and extremes, seasonal extremes and frequency of rainy days on any calendar date (rainfall in 100% of the 50 years on July 12, 19, 27 and 29 and on >45 out of 50 in 78 days from June to Sept.). Frequencies of intensities of spells of different lengths and intervals between rainy spells, spells of heavy rain, very heavy rains and associated weather situations, and variation from year to year are discussed and extensive tables and histograms or graphs presented to support text. *Subject Headings:* 1. Rainfall normals 2. Monsoon rainfall 3. Rainfall data 4. Long period records 5. Mangalore, Madras, India.—*M.R.*

8.6-292

551.577.21(6)

Ivanov, N. N., *O godovoi amplitude atmosferykh osadkov*. [Annual amplitude of precipitation.] *Vsesoiuznoe Geograficheskoe Obshchestvo SSSR, Izvestia*, 87(6):546-550, Nov./Dec. 1955. 3 figs., ref. **DLC**—By means of the relative annual amplitude of precipitation, namely the ratio of absolute amplitude to annual total of precipitation expressed in percent, the author investigates the presence and magnitude of the secondary maximum and minimum of precipitation in Africa. Two charts showing the isolines of the area of the secondary principal amplitudes of atmospheric precipitation in percent of annual totals and histograms giving examples of the different annual relative amplitudes of precipitation for various localities in Africa are presented. *Subject Headings:* 1. Precipitation amount 2. Isohyetal charts 3. Africa.—*I.L.D.*

8.6-293

551.577.3:551.590.25

Bowen, E. G. (*Div. of Radiophysics, C.S.I.R.O., Sydney, Australia*), *A relation between meteor showers and the rainfall of Nov. and Dec.* *Tellus*, Stockholm, 8(3):394-402, Aug. 1956. 8 figs., table, 17 refs. **DLC**—An examination is made of the Nov. and Dec. rainfall of approximately 300 stations distributed over the globe. Six singularities are found, five of which occur about 30 days after prominent meteor showers. This result is similar to one which has already been reported for the month of Jan. The remaining singularity on Nov. 26 could be due to a daylight meteor stream from the direction of Virgo which has just been discovered in the Southern Hemisphere. One of the better known meteor showers during the period investigated, namely the Giacobinids, is known to have an orbital period of 6.6 years. A similar recurrence tendency is found in the rainfall 30 days later. *Subject Headings:* 1. Rainfall singularities 2. Meteor influences.—*Author's abstract.*

8.6-294

551.577.3(66)

Rodewald, M., *Ungewöhnliche Ruckzugsgefechte der Regenzeit an der Elfenbeinküste*. [Unusual retreating action of the rainy season on the Ivory Coast.] *Wetterlotse*, No. 112:30-31, 34, Feb. 1957. 2 figs. **DLC**—In Dec. 1956 the Ivory Coast and Liberia had up to 400 mm rain, nearly three times normal. This was only one of a number of world-wide anomalies. *Subject Headings:* 1. Rainfall variations 2. West Africa.—*C.E.P.B.*

8.6-295

551.577.32(673)

*Queiroz, Dario Xavier, *Variabilidade das chuvas em Angola*. [Variability of rainfall in Angola.] Luanda, Angola, Serviço Meteorológico, 1955. 4 p. 22 graphs (some fold.), fig., 2 tables, eqs. English summary at beginning. **DWB**—The average annual rainfall, probable error, standard deviation and coefficient of variability are tabulated for 22 stations in Angola having 10-55 years of record. These coefficients are plotted on map (1 to 8 million) of Angola, and lines of equal coefficient of variation are drawn for 15, 20, 30, 50, 75 and 100% variability. Year-to-year variability for each station is shown on a separate folded graph sheet. In the dry regions of the S.W. (Mocamedes) coast the variability is extreme, with mean annual precipitation of 50 mm. The actual annual values range from 0 to 582%, in 24 yrs, whereas

in the moist northeastern equatorial plateau where annual rainfall averages around 1500 mm, the variability is <15%. At least 240 more stations were considered in drawing the isopleths (7 in Rhodesia and SW Africa). *Subject Headings:* 1. Rainfall variability 2. Angola.—M.R.

8.6-296

551.577.36(521.2)

*Saito, R. and Kikuchibara, H., *Some characteristic properties of intense rainfall in Kinki District.* *Journal of Meteorological Research*, Tokyo, 7(5):257-276, July 1955. 8 figs., 9 tables. In Japanese; English summary p. 257-258. DWB—Using 10 yrs (1941-50) of recording rain gage data for 12 stations in the Kinki district of Japan, the characteristics of the 10, 20, 30, 40 and 60 min rainfall intensity are analyzed in numerous ways and the results shown in tables and graphs (charts and mass curves, etc.). The probability of occurrence is reduced to a formula $P(X) = A \cdot 10^{BX}$ where A and B are constants for each station and $X = 5$ mm, etc. Rains of >10 mm in 10 min occur about twice a year, and >30 mm in 10 min once in 5-30 years (June-Oct.). A good correlation is found between frequency of 10 min and 60 min rainfalls, with maximum 1 hr amount being 2-3 times the maximum 10 min amount. However, there is no good correlation between one station and another having intense rainfalls during any given storm or year. Cyclones and fronts account for 60-70% of all cases of intense rains, typhoons for 30%, Bai-u and thunderstorm cases for the remainder. Typhoons cause greater 24 hr amounts but not necessarily great 10 min intensities. *Subject Headings:* 1. Rainfall intensity duration frequencies 2. Typhoon rainfall 3. Kinki District, Japan.—M.R.

8.6-297

551.577.37:551.311.2

§Dallant, M., *Les causes météorologiques de la catastrophe de Menton.* [Meteorological causes of the catastrophe in Menton.] *La Météorologie*, 4th Ser., No. 28:169-171, Oct./Dec. 1952. 7 figs. (6 synoptic charts). DWB—Exceptionally heavy rains (250 mm or 10") on April 22-24 in the Menton region resulted in a devastating landslide on April 24, 1952. Sample series of surface synoptic charts (12 hourly intervals) show the development of a small secondary along a stationary occlusion, extending from a North Sea cyclone to a Moroccan low. On the day of the mud slide, which buried many homes and caused 11 deaths, 125 mm (5") of rain fell at Menton. *Subject Headings:* 1. Mud slides 2. Excessive rainfall 3. Menton, France.—M.R.

8.6-298

551.577.37

Harrison, L. P., *Project to compute precipitation quantitatively.* Washington, D. C., U. S. Weather Bureau, 1955. 4 p. 6 eqs. Carbon of typescript. DWB—A mathematical expression is given for quantitative calculation of maximum possible precipitation over areas of various sizes, shapes, locations, orography, etc. The meteorological factors to be considered would be: development of clouds, transport of moisture into the system, condensation of water vapor, convection of warm air and water to freezing levels, terminal velocities of condensation products, evaporative water loss, divergence-convergence of column, turbulence in cloud and environment, lapse rates and their changes, change of phase of water vapor, radiation, frontal surface flow, interaction of air masses, energy transformations (kinetic, potential, internal, latent, frictional losses) etc. *Subject Headings:* 1. Precipitation calculations 2. Maximum possible precipitation computation.—M.R.

8.6-299

551.577.37:627.51(944)

Jamieson, L. N. (*Inspecting Engr., Water Supply Investigation Sec., Water Supply and Sewerage Branch, Dept. of Public Works, N.S.W.*), *Hydrologic studies for Adaminaby Dam.* *Institution of Engineers (of) Australia, Sydney, Journal*, 26(10/11):247-255, Oct./Nov. 1954. 12 figs., table. DLC—This paper describes the policy adopted by the Dept. of Public Works, N.S.W., for the protection of Adaminaby Dam from floods, and the technique used for the synthesis of a design flood. The study required an estimate of the maximum possible precipitation on the catchment and the derivation of a number of infiltration indices and a unit hydrograph. The inflow hydrograph thus obtained was routed through the storage to determine the maximum rise in water level to be expected. *Subject Headings:* 1. Flood protection 2. Excessive precipitation 3. New South Wales.—Author's abstract.

8.6-300

551.577.37:551.576.12(43)

King, R., Heavy rainfall and interesting cloud forms at Wunstorf on July 2, 1956. *Meteorological Magazine*, London, 86(1016):57-58, Feb. 1957. fig., 4 refs. DWB—Between 1430 and 1540 h 58.2 mm of rain fell (40 mm 1450-1510). CuNb 7 oktas at 1200 ft with a peculiar cloud formation below, base at 400 ft above ground with a domed top at 800 ft lifting and merging with cloud above. *Subject Headings*: 1. Cloud forms 2. Excessive precipitation 3. Wunstorf, Germany.—C.E.P.B.

8.6-301

551.577.37(914)

Pflugbeil, W., Der krasse Niederschlagsgegensatz auf den Philippinen im Dezember 1956. [The gross rainfall contrast on the Philippines in Dec. 1956.] *Wetterlotse*, No. 112:28-29, Feb. 1957. 2 figs. DLC—The N.E. monsoon normally brings 400-600 mm rainfall to E. coast of Philippines. In Dec. 1956 this was increased by typhoons to 1300 mm at Surigao on Mindanao, causing extensive floods. *Subject Headings*: 1. Excessive precipitation 2. Philippine Islands.—C.E.P.B.

RAIN, SNOW AND HAIL

See also: U. S. hailstorms (Flora), 8.6-8; Crop-Hail Insurance Actuarial Assoc. (Roth), 8.6-101; Wind effects on snow (Visser), 8.6-259.

8.6-302

551.578.11:531.66

Mazin, I. P., Raschet otlozheniia kapel' na kruglykh tsilindricheskikh poverkhnostiakh. [Calculation of the deposition of drops on round cylindrical surfaces.] *Leningrad. Tsentral'naiia Aerologicheskaiia Observatoriia, Trudy*, No. 7:39-49, 1952. 6 figs., table, 5 refs., eqs. DLC—The problem of calculating the deposition of drops from an air current upon a surface is set up as follows: upon a stationary cylinder with radius A flows an air current with velocity u_0 at infinity; together with the air current cloud droplets with a velocity μ_0 at infinity impinge upon the cylinder. The trajectory of these droplets is to be determined if the physical environmental data are given. The solution of this problem for conditions (1) in which the flow around the cylinder is ideal, the fluid is incompressible and the droplets do not influence the linear flow of air is presented and the conditions (2) under which Stokes' flow is applied are examined. *Subject Headings*: 1. Drop impingement measurement 2. Drop impingement on ellipsoids.—I.L.D.

8.6-303

551.578.11-531.66

von Glahn, Uwe H.; Gelder, Thomas F. and Smyers, William H., Jr., A dye-tracer technique for experimentally obtaining impingement characteristics of arbitrary bodies and a method for determining droplet size distribution. *U. S. NACA, Technical Note*, 3338, March 1955. 73 p. 26 figs., table, 18 refs., 29 eqs. DWB—A dye-tracer technique has been developed from which the droplet impingement characteristics of bodies can be determined by colorimetric analysis. The technique is applicable to various wind tunnels provided the humidity of the air stream can be maintained near saturation. A method is also presented whereby the droplet size distribution of the impinging cloud may be determined by relating the experimental impingement characteristics of a body to the theoretical trajectory results for the same body. *Subject Headings*: 1. Dye tracer technique 2. Drop size distribution 3. Ice formation 4. Ice prevention 5. Ice removal.—Authors' abstract.

8.6-304

551.578.11

Zierp, J., Über die Kräfte und Momente, die auf einen Tropfen in scherender Strömung wirken. [Forces and moments affecting a drop in a shearing air flow.] *Zeitschrift für Flugwissenschaften*, Brunswick, 3(1):22-25, Jan. 1955. fig., numerous eqs. DLC—A theoretical analysis of the behavior of a globular drop in a horizontal air flow, the speed of which varies with height, is presented. In the first part of the paper the author studies the flow around the body and examines a smooth, stationary, incompressible flow without friction. In the second part, he discusses and calculates the forces and moments affecting the drop in a two dimensional case when the flow undergoes slight disturbance. Pt. 3 deals with a three-dimensional case. *Subject Heading*: 1. Terminal velocity of drops.—A.M.P.

8.6-305

551.578.4:551.501.3

551.574.42:551.501.3

International Union of Geodesy and Geophysics. Commission on Snow and Ice, **International classification for snow (with special reference to snow on the ground)**. *National Resources Council of Canada Associate Committee on Soil and Snow Mechanics, Technical Memorandum*, No. 31, Aug. 1954. 11 p. 11 tables. **DWB**—A classification scheme devised after 1948 Oslo meeting of the I.U.G.G., to provide a uniform system for I.U.G.G. and W.M.O. use. Sec. 1 is based on form of crystal or particle; Sec. 2 deals with deposited snow (physical characteristics); Sec. 3 with measurements required to describe snow cover; and Sec. 4 with surface deposits such as hoar, soft and hard rime, glaze, surface roughness and penetrability. *Subject Headings*: 1. **Snow classification schemes** 2. **Snow properties** 3. **Ice deposit classification**. I. Schaefer, V. J. II. Klein, G. J.—*M.R.*

8.6-306

551.578.4(410):551.501

§Snow survey of Great Britain, Season 1955-56. *Meteorological Magazine*, London, 85(1014):353-361, Dec. 1956. 5 figs. **DWB**—Snowfall was about average. Maps show number of days of snow falling and of snow lying. The weather of Sept. 1955-May 1956 is summarized; the heaviest fall was on Feb. 20-21 with E winds (synoptic chart). Mean number of days with snow cover at 2500 ft was 97 (9-year average, 83). Distribution in relation to height is shown daily and by means. *Subject Headings*: 1. **Snow surveys** 2. **Great Britain**.—*C.E.P.B.*

8.6-307

551.578.41

551.578.7

Takahashi, Kihei, **Graupel and snow pellets**. *Seppyo (Snow and Ice)*, Tokyo, 12(5):170-171, 1951. tables, figs. In Japanese. **DWB**—Some miscellaneous observations such as radius, density and temperature were made for graupel and snow pellets in northern Japan. The density increases from 0.07 g/cm³ to 0.15 g/cm³ as the diameter of graupel increases from 1 mm to 6 mm. *Subject Headings*: 1. **Graupel** 2. **Snow pellets** 3. **Japan**.—*H. Arakawa*.

8.6-308

551.578.46(436)

Hoinkes, H., **Zur Bestimmung der Jahresgrenzen in mehrjährigen Schneeansammlungen**. [On the determination of the annual limits in many years snow accumulations.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 8(1):56-60, 1957. 2 figs., 4 refs. German, English and French summaries p. 56. **DWB**—In spring on the high E. Alps the snow cover has generally a characteristic distribution of density and temperature. Density increases from surface to a maximum below middle depth and then decreases again in lower layers; temperature falls rapidly to a minimum and then rises slowly (Hintereisfirner at 2950 m, April 7, 1955). The denser layer formed in one winter lasts several years, and the density stratification is an index of the ice economy of the glacier. *Subject Headings*: 1. **Snow density profiles** 2. **Alps**.—*C.E.P.B.*

8.6-309

551.578.46(439.1)

*Kéri, Menyhért, **Budapest hóviszonyai**. [Snow conditions of Budapest.] *Beszámoló az 1955-ben végzett tudományos kutatásokról* (issued as *Hungary. Országos Meteorológiai Intézet, Hivatalos Kiadványai*, Vol. 20, pub. 1955), p. 166-172. fig., table, 3 refs. Russian and German summaries p. 166. **DWB**—Snow cover data for 13 stations in Budapest (including suburban areas) are presented for the 15 winters 1929/44. The values tabulated are: 1) average number of days with snow cover for each winter month, 2) average depth of snow, 3) maximum depth of snow and 4) first and last day of snow cover. A map shows station locations and average snow cover frequency distribution. *Subject Headings*: 1. **Snow cover variations** 2. **Budapest, Hungary**.—*G.T.*

8.6-310

551.578.46:551.556.2

Rakitskiĭ, N. P., Vyskazyvaniia P. A., Kostycheva po povodu zaderzhaniia snegovykh vod v pole. [Memoir by P. A. Kostychev on the retention of water in the fields.] *Pochvovedenie*, Moscow, No. 11:55-58, Nov. 1955. 2 figs. **DLC**—This is the first printing of P. A. KOSTYCHEV's (1843-1917) memoir **On investigations dealing with the retention and accumula-**

on of snow on fields with the aid of hedge rows and other means, submitted in 1892. The arrangement of the hedge rows is described with the aid of diagrams. *Subject Headings:* 1. Snow retention 2. Shelter belt effects.—*I.L.D.*

8.6-311

551.578.48(521.13):551.579.2

Sendai District, Japan. Central Meteorological Observatory, On the snow survey and the runoff from melting snow in the upper basin of River Naruse, Miyagi Prefecture, from March to June 1955 (Brief report). *Journal of Meteorological Research*, Tokyo, 8(3):144-153, March 1956. 9 figs., 5 tables, 14 refs., 6 eqs. In Japanese; English summary p. 144. DWB, DLC—Snow survey and investigation of runoff from melting snow were carried out in the upper basin (area 111.94 km²) of River Naruse, from March to June 1955. Some of the results obtained are as follows: The daily variations of the average density of snowpack owing to snowfall and snow melting are significant and greater than those owing to other factors such as altitude, slope direction, etc. The air temperatures at any of the altitudes of the basin and at the same levels in the free air above Sendai are not equal. From temperature observations in the snow survey 0.5°C/100 m is obtained as the average lapse rate from March 8 to 16. A chart for estimating the daily mean effective temperature from maximum and minimum temperatures and weather is prepared. The runoff ratio (*r*) and the daily runoff distribution (*f*) are obtained. The hydrograph calculated by using *r* and *f* agrees well with the observed one. *Subject Headings:* 1. Snow cover effects 2. Snow melt runoff 3. Sendai, Japan.—*From author's abstract.*

HYDROMETEOROLOGY

See also: Flood control in Asia (United Nations. Econ. Commiss. for Asia and Far East), 8.6-6; Flood (Dempsey), 8.6-19; Tree growth (Hayes, Buell), 8.6-93; Soil water economy in forests (Stålfelt), 8.6-95; Soil moisture sampling (Ravasz), 8.6-111; Snow and runoff, Miyagi Prefecture, 8.6-311.

8.6-312

551.579:551.509.58

Chizhov, O. P., O vozmozhnosti prognoza urovnia Amu-Dar'i pri ee zameranii. [Possibility of forecasting the water level of the Amu-Daria River during its freezing up.] *Meteorologiya i Gidrologiya*, Leningrad, No. 5:44-46, Sept./Oct. 1955. 2 figs. DWB, DLC—The general laws of freezing of rivers are applied to the Amu-Daria. On the basis of these laws it was possible to establish at several water gaging stations of its lower course, graphical relationships between the rate of movement of the ice floes and rise in water level during freezing on the one hand and the air temperature at the nearest weather station on the other. *Subject Headings:* 1. Water level forecasting 2. Freezing of rivers 3. Amu-Daria River, Asiatic J.S.S.R.—*I.L.D.*

8.6-313

551.579:627.51

Gumbel, E. J. (Columbia Univ., N. Y.), The calculated risk in flood control. *Applied Scientific Research*, Sec. A, The Hague, 5:273-280, 1955. 2 figs., 4 refs., 24 eqs. DLC—Given the number of years a structure has to stand, and the allowable probability of failure during this period, the author derives the magnitude of the design flood on the basis of which the structure has to be computed. This rational probability approval should replace the arbitrary safety factors now used by engineers and for actuarial calculations. *Subject Headings:* 1. Flood control 2. Statistical techniques.—*A.A.*

8.6-314

551.579:551.311.12(82)

Heinsheimer, Georg J., Zur Hydrologie und Glaziologie des Lago Argentino und Ventisquero Moreno, Argentinien, II. [Hydrology and glaciology of Lake Argentino and Ventisquero Moreno, Pt. 2.] *Zeitschrift für Gletscherkunde und Glazialgeologie*, 3(3):327-333, 1956. 4 refs. German, English and Spanish summaries p. 327-328. DLC—In Aug. 1954, 17 months after the breakdown of the ice dam on March 30, 1953, the Moreno glacier again blocked the Canal de los Tempanos. The glacier had considerably increased in depth and might outlast summer of 1954/5, causing a greater accumulation of water in the lake than previously known. If the ice-dam broke, this would cause a dangerous flood on L. Argentino

and the Rio Santa Cruz. *Subject Headings:* 1. Lake levels 2. Glaciers 3. Lake Argentino, Argentina.—C.E.P.B.

8.6-315

551.579 (689)

Natural water and its use in S. Rhodesia, pt. 1, The hydrologic cycle. *Rhodesia Agricultural Journal*, Salisbury, 49(4):203-211, July/Aug. 1952. Pt. 2, Water in the atmosphere. *Ibid.*, 49(5):272-279, Sept./Oct. 1952. Pt. 3, Water and the soil. *Ibid.*, 49(6):384-391, Nov./Dec. 1952. Pt. 4, Runoff and summer streamflow. *Ibid.*, 50(1):54-67, Jan./Feb. 1953. Pt. 5, Use of water by vegetation. *Ibid.*, 50(3):255-262, July/Aug. 1953. Pt. 6, Underground water and its use in southern Rhodesia. *Ibid.*, 50(6):486-490, Nov./Dec. 1953. Pt. 7, Conservation aspects. *Ibid.*, 51(3):193-196, May/June 1954. Pt. 8, General review and suggestions for research. *Ibid.*, 51(6):478-488, Nov./Dec. 1954. tables and figs. throughout the 8 articles. All are reprinted also as *Southern Rhodesia. Minister of Agriculture and Lands*, [Meteorological Dept.?], *Bulletin*, No. 1661, 1682, 1695, 1703, 1722, 1747, 1770 and 1795.—A general discussion in popular form, urging the need for intensified research in hydrology in order to achieve a better utilization of available water supply. It is a useful introduction to the numerous aspects of the hydrologic cycle. The scientist will be interested in the approximate distribution of rainfall into evaporation, runoff, etc. for Rhodesia (Pt. 1 and 8), characteristic soil moisture constants (Pt. 3), available annual data for rainfall and runoff for 4 catchments and pan evaporation (Pt. 4), as well as ground water table, related to rainfall (Pt. 4). *Subject Headings:* 1. Hydrologic cycle 2. Transpiration 3. Runoff 4. Southern Rhodesia.—A.A.

8.6-316

551.579.2 (787, 788)

Koelzer, Victor A., Use of melt-season snow surveys. *Western Snow Conference, Salt Lake City, April 1954, Proceedings*, p. 86-89. pub. 1954. fig., 2 refs. DWB—Experimental extension of snow surveys in the upper basin of the North Platte (Wyoming and Colorado) after May 1 (May 15 and June 1) has proved the usefulness of these surveys during the melt season at high elevations. The May 1 measurements are not as valuable in relation to subsequent stream flow as are the May 15 and June 1 measurements, since a large amount of the runoff from May 1-15 goes toward replenishing soil moisture in the Basin. After May 15 a larger percentage is directly converted into stream runoff. Accurate forecasts at this time of year can help greatly in regulating reservoirs to maintain capacity for summer irrigation and not risk sudden spillage in flood years as in 1952, as comments by STOCKWELL indicate. *Subject Headings:* 1. Melt season snow surveys 2. North Platte Basin. I. Stockwell, Homer J.—M.R.

8.6-317

551.579.4:627.51

Ford, Erwin C.; Cowan, Woody L. and Holtan, N. H. (all, U. S. Soil Conservation Serv.), Floods—and a program to alleviate them. *U. S. Dept. of Agriculture, Water: the Yearbook of Agriculture*, 1955:171-176. pub. 1955. DA, DWB—The Soil Conservation Service estimates that annual loss by floods to agriculture in U. S. is over half a billion dollars (estimates based on 15 years to 1952 and 77 watersheds with 52% of area of U. S.). Upstream losses are greatest over most of the U. S. but in Pacific Coast and North Atlantic States downstream nonagricultural losses are heavier than agricultural losses. Major floods are a result of a combination of events which occur only once in a long period of years in any given basin, but small floods are frequent and measures to control them, such as are outlined, can reduce flood losses tremendously. These measures are of two types: 1) land use and water retardation on farms and creeks that benefit the farmer who pays for them, and 2) major retardation works and channel improvement that helps those downstream. *Subject Headings:* 1. Flood control 2. Land management.—M.R.

8.6-318

551.579.4

Langbein, W. B. and Wells, J. V. B. (both, U. S. Geological Survey), The water in the rivers and creeks. *U. S. Dept. of Agriculture, Water: the Yearbook of Agriculture*, 1955:52-62. pub. 1955. figs., 9 refs. DA, DWB—Difference between hydrographs of stream flow in large (river) and small (creek) basins is shown dramatically and discussed. Average annual runoff of <1", 1"-10" and >10" is shown on a map of the U. S., and seasons of the highest

and of lowest streamflow, respectively, and normal monthly distribution of runoff throughout year (shown on histograms) on other maps. Effect of snowmelt in high mountain regions in delaying peak runoff until summer is evident on the charts. There may be several months difference between peak runoff dates for lowland and high altitude creeks in the same area (or between lowland creeks and the big rivers that rise in the high mountains and flow through these same lowlands). Snowmelt produces a more sustained flow than rainstorm flow. Temperature affects evaporation and hence streamflow runoff. *Subject Headings: 1. Stream flow variations 2. Stream flow charts 3. United States.—M.R.*

8.6-319

551.579.5:551.577

Musgrave, G. W. (*U. S. Soil Conservation Serv.*), **How much of the rain enters the soil?** *U. S. Dept. of Agriculture, Water: the Yearbook of Agriculture*, 1955:151-159. pub. 1955. figs., 5 refs. **DA, DWB**—To accurately determine rate of infiltration in various soils or with different covers, artificial showers or rain must be applied in connection with infiltrometer measurements. Various curves show effects of: surface cover (row crops vs. meadow grass); porosity, depth and organic content of soil, moisture content or degree of saturation; duration of rainfall; season or time of day (temperature of air, water or soil); and viscosity of water. Over 100 soil types found in U. S. are grouped into 4 classes giving lowest, low, high and highest infiltration rates, respectively. Curves for second storms on wet soils of the 4 types reveal striking differences in infiltration. *Subject Headings: 1. Infiltration 2. Soil moisture 3. Soil classification.—M.R.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

See also: Climat. data for determining length of runways (Tardos), 8.6-70; *Climatic extremes, U. S.* (Cooke), 8.6-98; *Bioclimat. res.* (Lotmar, Häfelin), 8.6-107; *Climat. and met.* (Heyer), 8.6-150.

8.6-320

551.58

Landsberg, Helmut L., **Climatology: a useful branch of meteorology.** *Royal Meteorological Society, Canadian Branch, [Publications]*, 6(6), Oct. 27, 1955. 12 p. table, 19 refs. **DWB**—The author discusses the role of climatology in weather forecasting, the use of climatic data in determining the nature and reality of singularities, the use of climatic data in agriculture, in industrial activities (such as construction heating) and in the application of microclimatic principles. A table showing the average climatic changes produced by a typical large industrial city is included. *Subject Headings: 1. Climatology 2. Applied climatology.—I.L.D.*

8.6-321

551.58:519.241.8

Uttinger, Heinrich, **Beidseitig begrenzte Kollektive in der Klimatologie. Ein Beitrag zur klimatologischen Statistik.** [Ambilaterally limited populations in climatology. A contribution to climatological statistics.] *Schweizerische Naturforschende Gesellschaft, Verhandlungen*, 135:116-117, 1955. eq. **DWB**—A formula is developed for determining the frequency distribution in statistical series which are limited both upward and downward. The distribution curves obtained by the formula are bell-shaped, steadily declining or U-shaped lines. All three types occur in climatology (the first two, for example, in precipitation statistics and the last in cloudiness and sunshine duration). *Subject Headings: 1. Frequency distributions 2. Climatic data presentation.—G.T.*

CLIMATIC ZONES

8.6-322

551.581

Kanonnikov, A. M., **K voprosu o prirodnnykh zonakh.** [Natural zones.] *Vsesoiuznoe Geograficheskoe Obshchestvo SSSR, Izvestiia*, 87(60):529-534, Nov./Dec. 1955. 2 tables, 17 refs. **DLC**—The criteria for establishing natural zones are examined and the special significance of climate in determining the characteristics of natural zones is discussed. On the basis of climatic features, the author presents a system of natural zones consisting of 11 funda-

mental natural zones, which can be subdivided into 19 intermediate zones and into types of subzones. *Subject Heading: 1. Climatic zones.*—I.L.D.

CLIMATE OF PARTICULAR PLACES

See also: Climate of China (Lu), 8.6-17; *Canadian North* (Arens), 8.6-23; *Gough Island survey* (Heaney), 8.6-47; *Climate of Canada* (Robinson), 8.6-341.

8.6-323

551.582(494)

Biéler, Pierre-Louis (*Cointrin*), Quelques constations sur des différences de climat observées durant l'année 1953 entre Cointrin Begnins (Vaud) et Saxon (Valais). [Some evidence on the differences in climate observed during 1953 between Cointrin Begnins (Vaud) and Saxon (Valais).] *Schweizerische Naturforschende Gesellschaft, Verhandlungen*, 134:114-115, 1954. DWB, DLC—A discussion of results of simultaneous daily observations and recordings of such climatic elements as: minimum, maximum and mean air temperatures, relative humidity, number of hours of insolation and precipitation amount, which were carried out to determine the effect of these elements on the local climate. It was found that variations of these elements, connected with the passing of perturbations, have almost the same effect in each locality. *Subject Headings: 1. Local climates 2. Switzerland.*—A.M.P.

CLIMATIC CHANGES

8.6-324

551.583

Callendar, G. S., Climatic changes. *Weather*, 12(2):67, Feb. 1957° DWB—Criticisms of R. G. VERYARD, Some thoughts on climatic change, in *Weather*, 11(11):355-364, Nov. 1956 (see 8.2-262, Feb. 1957, MAB). *Subject Heading: 1. Climatic change theories.*—C.E.P.B.

8.6-325

551.583.2(52)

Arakawa, H., Climatic change as revealed by the data from the Far East. *Weather*, 12(2):46-51, Feb. 1957. 2 figs., 2 photos, 2 tables, 14 refs. DWB—Blooming dates of cherry at Kyoto show cold periods 11th-14th and 16th centuries. Freezing dates of Lake Suwa since 1440 and first snow cover at Tokyo since 1632 show cold periods in the early years. Rainfall at Seoul, Korea, since 1770 shows a dry period from 1880-1910. *Subject Headings: 1. Historical climates 2. Japan.*—C.E.P.B.

8.6-326

551.583.2:551.311.12(235.243)

Kick, W., Der Chogo-Lungma-Gletscher im Karakorum. [The Chogo-Lungma Glacier in Karakoram.] *Zeitschrift für Gletscherkunde und Glazialgeologie*, 3(3):335-347, 1956. Chart, 11 photos, 22 refs. German and English summaries p. 345-346. DLC—Information about Chogo-Lungma is fairly complete since 1835, and shows a cycle of changes similar to that of European glaciers. Glaciation increased during first half of 19th Century to an extent greater than for several centuries, and remained high during the second half, reaching its maximum towards the end of the century. Since at least 1920 it has undergone a rapid retreat. *Subject Headings: 1. Glacier variations 2. Chogo-Lungma Glacier, Karakoram, India.*—C.E.P.B.

8.6-327

551.583.2:551.311.12(234.3)

Moser, Roman, Hundert Jahre Schwund der Dachstein-Gletscher. [Hundred-year decrease of the Dachstein Glacier.] *Zeitschrift für Gletscherkunde und Glazialgeologie*, 3(3):369-370, 1956. 2 tables, ref. DLC—From 1850/56 to 1951/52 various parts of Dachstein Glacier decreased from a total of 10,918 to 5964 m². Ice mass lost was 481,709 cu. m. *Subject Headings: 1. Glacier retreat 2. Dachstein Glacier, Alps.*—C.E.P.B.

8.6-328

551.583.3(62,55,56)

†Butzer, Karl W., Late glacial and postglacial climatic variation in the Near East. *Erdkunde*, 11(1):21-35, Feb. 1957. 5 figs., 70 refs. German summary p. 21. DWB—Attempts a parallel to European chronology in Egypt, Syria, Mesopotamia and Persia. Following

stages recognized: Post-pluvial I, Dry and a little cooler; much wind erosion. Peak in 11th Millennium B.C.

Subpluvial I, 9th millennium. Rainy, cool. Advance of small highland glaciers.

Post-glacial IIa, 8000-6500 B.C. Drier than today; warmer.

Post-pluvial IIb, 6500-5000 B.C. Present climate.

Subpluvial II, 5000-2400 B.C. Rainy but warmer. Short dry periods before and after 4000 and about 3000 B.C.

Post-pluvial III, 2400-850 B.C. Renewed aridity. Moist interval in 12th Cent.

Post-pluvial IVa, 850 B.C.-700 A.D. A little drier than now with warmer winters. Great drought 590-645 A.D.

Post-pluvial IVb, Since 700 A.D. Increasing number of cold winters. Variable rainfall.

Subject Headings: 1. Postglacial climates 2. Near East.—C.E.P.B.

8.6-329

551.583.3:551.311.13(235.243)

Heuberger, Helmut, *Beobachtungen über die heutige und eiszeitliche Vergletscherung in Ost-Nepal*. [Observations on the present and Ice Age glaciation in east Nepal.] *Zeitschrift für Gletscherkunde und Glazialgeologie*, 3(3):349-364, 1956. 3 figs., 2 photos. German and English summaries p. 363-364. **DLC**—The present snow line at the west end of the Mt. Everest group is 18,000 ft on the south and 19,400 ft on the north side. There were two late glacial advances, the younger showing a depression of snow line by 2000 ft. Older gravels and cirques are present, the latter at a height of 13,000 ft. In the foothills of the Himalayas in E. Katmandu cirques and small moraines at 6800 ft point to a depression of snow line by 6500 ft. *Subject Headings: 1. Glacial periods 2. Himalayas, Nepal.—From author's abstract.*

8.6-330

551.583.3(728.6)

Weyl, Richard, *Eiszeitliche Gletscherspuren in Costa Rica (Mittelamerika)*. [Ice Age glacier traces in Costa Rica.] *Zeitschrift für Gletscherkunde und Glazialgeologie*, 3(3):317-325, 1956. 4 figs., 2 charts, 2 tables, 11 refs. German and Spanish summaries p. 324. **DLC**—In the Cordillera de Talamanca numerous traces of glacial action have been discovered. The cirques indicating the snow line lay at 3500 m, moraines extend down to 3350 m. This is lower than in neighboring parts of Central America, due to local climatic conditions. *Subject Headings: 1. Ice ages 2. Costa Rica.—C.E.P.B.*

MICROCLIMATOLOGY

See also: Bunger oasis, Antarctica (Täubert), 8.6-50; Glaciology (Baird), 8.6-81; Effect of artificial atmos. conditions on crops (Száva-Kovács), 8.6-89; Micromet. observations in shelter belts, Bulgaria (Stružka, Uhlíř), 8.6-262; Climatic regionalization (Borisov), 8.6-333.

8.6-331

551.584.3

Schneider, Max, *Arbeitsausschuss Geländeklimatologie*. [Working committee: Topoclimatology.] *Germany. Deutscher Wetterdienst, Mitteilungen*, 2(14):154-158, 1955. fig. **DWB**—The scope of terrain climatology which is intermediate between macro- and micro-climatology, its importance in the climatic improvements of cultivated areas, the mapping of terrain climates by agrometeorological services and the formation of the "Working Committee on Topoclimatology" and its program are discussed. A map shows the areas in West Germany where terrain climatic mapping has been carried out. *Subject Headings: 1. Terrain climatology 2. Agricultural climatology 3. Topoclimatology.—I.L.D.*

8.6-332

551.584.61:685

Westbrook, Jane Howe, *Storage environment of leather items in army warehouses. U. S. Quartermaster Corps. Research and Development Command. Environmental Protection Div., Research Study*, Report EA-6, Jan. 1956. 14 p. 3 tables, 3 figs., 11 refs.—This study aims at establishing the most favorable air temperature and humidity conditions for the storage of leather goods prevailing in the various Quartermaster depots in the U. S., Panama and the Territory of Hawaii. The author discusses the temperature and humidity values

for safe storage of leather goods and presents data on the range of temperature and humidity conditions in warehouses, the number of hours at each depot for each month when temperature and humidity conditions were conducive to leather hydrolysis and classification of temperature and humidity conditions for leather storage. *Subject Headings:* 1. Warehouse climates 2. Leather storage.—*I.L.D.*

CLIMATIC CLASSIFICATION

See also: Humid tropics research, 8.6-39; Tropical rain forest (Wendelbo), 8.6-96; Moisture of continents (Budyko), 8.6-115.

8.6-333

551.585:551.584(47)

Borisov, A. A., *O printsipakh klimaticheskogo raionirovaniia*. [Principles of climatic regionalization.] *Vsesoiuznoe Geograficheskoe Obshchestvo SSSR, Leningrad, Izvestiia*, 87(3): 279-284, May/June 1955. fig., table, 3 refs. **DLC**—A scheme for climatic regionalization is described and illustrated with the example of Crimea. The general climatology of the Crimea, including the prevailing air masses, weather, radiation and moisture cycle is described and the area as a whole is subdivided into climatic regions characterized by specific structural features such as continentality, steppe, wind regime, etc., radiation balance and then subdivided into zones based upon radiation, circulation elements, moisture exchange, topographic elements, type of microclimate and quantitative characteristics or limits determined by temperature and precipitation. In turn these zones are subdivided into regions (local climate) according to economic specialization and variation of climatic elements. A map showing the climatic regionalization of the Crimea is presented. *Subject Headings:* 1. Climatic classification 2. Microclimatology 3. Crimea.—*I.L.D.*

8.6-334

551.585.1(269)

Vowinkel, E. and van Loon, H., *Das Klima des Antarktischen Ozeans III, Die Verteilung der Klimaelemente und ihr Zusammenhang mit der allgemeinen Zirkulation*. [The climate of the Antarctic Ocean, Pt. 3, The distribution of the climatic elements and their relation to the general circulation.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 8(1):75-102, 1957. 13 figs., 4 tables, 27 refs. German, English and French summaries p. 75-76. **DWB**—Circumpolar charts S of 45°S based on various authors are discussed. Air and sea isotherms in Jan. are nearly parallel, with an isothermal zone in Atlantic sector in 60°S; there is a zone of steep gradient marking the polar front and Antarctic convergence. Sea-air temperature differences, pressure departures from latitude means and temperature differences Dec.-Jan. are tabulated, temperature change Jan.-Feb. and 1920-34 to 1945-55 are plotted. Charts are given and discussed for Jan. for cloudiness, pressure, resultant winds and mean wind strength. The transition from W to E winds is especially sharp off Enderby Land and Wilkes Land. The course of the sub-Antarctic trough is traced; it is least known in the Pacific sector. Pressure distribution in July is briefly referred to; the meridional component is greater than in Jan. *Subject Headings:* 1. Climatic surveys 2. Antarctic Seas.—*C.E.P.B.*

8.6-335

551.585.5:551.556

Bhattacharya, N., (Dept. of Geog., Banaras Hindu Univ.), *Climatic regimes in arid lands. Science and Culture*, Calcutta, 22(1):13-17, July 1956. **DLC**—Desert lands are extensive (80,000 sq mi) in N.W. India (Rajasthan) and are encroaching on fertile lands of Punjab, Delhi and Uttar Pradesh. Wind action is the most important agent in development of landforms in the desert. Temperature and water or rain erosion are also important. Wind acts through transport, corrosion, deflation and deposition. Dust storms, sand driving effects, sorting action of wind, dune growth, rounding and polishing, temperature and rainfall effects are discussed in theory and practice in separate paragraphs. *Subject Headings:* 1. Arid zones 2. Geomorphology of arid lands 3. Arid climates 4. Dust storms 5. Wind effects in deserts 6. Rajasthan, India.—*M.R.*

8.6-336

551.585.5:631.58:632.9

Reichert, I., *The occurrence of plant diseases in arid climates and their agricultural significance*. (In: Institute of Biology, London, *Biology of deserts*. London, 1954. p. 68-

75. 21 refs.) **DWB**—The author discusses the utilization of exothermic climate to control plant diseases with particular reference to xerothermal climates which are either rainless or almost so during the summer (the principal growing season for many crops) so that only a relatively few pathogens can complete their developmental cycle. Examples from observations on plant diseases made in Israel and other parts of the Middle East are presented. Diseases of cereals (wheat, maize), vegetables (solanaceous crops), plantations (deciduous trees, Mediterranean trees) and industrial plants (tobacco) are discussed. *Subject Headings:* 1. Plant diseases 2. Arid zone agriculture 3. Middle East.—*I.L.D.*

8.6-337

551.585.5(56)

Tanoğlu, Ali (*Istanbul Univ.*), **Drought index of Turkey**. 2 p. Typescript, translation of original article **Indicates d'aridité de la Turquie** from *Türk Coğrafya Dergisi*, Ankara, 1(1):39-41, 1943. **DWB**—A small drought index (DE MARTONNE) chart of Turkey shows areas which are very dry, dry and suitable for dry farming, respectively (1-10, 10-15 and 15-20), and other areas which are more humid (20-25, 25-30, 30-40, 40-50, 50-60 and >60 on index scale). This chart is taken from article published in Turkish in 1943. The fact that warm regions are drier than cold areas with the same or more precipitation is emphasized. *Subject Headings:* 1. Aridity index 2. Aridity charts 3. de Martonne index 4. Turkey.—*M.R.*

8.6-338

551.585.53(61)

551.586:551.45

Bagnold, R. A., **The physical aspects of dry deserts**. (In: Institute of Biology, London, **Biology of deserts**. London, 1954. p. 7-12. ref.) **DWB**—The author describes the general characteristics and meteorological causes of dry deserts, the effect of surface relief, soil and geology on the absorption and storage of desert rainfall, moisture variation in wind erosion deserts, the interannual variability of rainfall in deserts, the mean effective rainfall (Libyan Desert), the mean rainless period, influence of rain on nomadic life, the effect of small long period rainfall, changes of cloud and rain season and changes of wind direction on plant cover and the biological limit of deserts. *Subject Headings:* 1. Desert climates 2. Desert bioclimatology.—*I.L.D.*

8.6-339

551.585.53(54)

Rathjens, Carl, **Physisch-geographische Beobachtungen im nordwestindischen Trockengebiet (Ein erster Forschungsbericht)**. [Physical-geographical observations in the north-west Indian dry region: first research report.] *Erdkunde*, 11(1):49-58, Feb. 1957. 5 figs., 22 refs. English summary p. 49. **DWB**—The great Indian desert (Tharr, Westrajasthan) has summer rains of 100-500 mm (map given) but high temperatures. Lakes such as Sambhar are without outlet and salt; rivers lose themselves in sand. Winds are weak from W in winter; from March a strong SW wind drives sand before it. There was no pluvial period corresponding to Wurm glaciation, but there was a postglacial period drier than today, during which great dunes were formed. *Subject Headings:* 1. Desert climates 2. Tharr Desert, N.W. India.—*C.E.P.B.*

BIOCLIMATOLOGY

See also: **Acclimatization**, F. Africa (Weight), 8.6-15; **Hay-drying weather** (Joos), 8.6-88; **Design-temp. for heating** (Gt. Brit. Ministry of Works), 8.6-97; **Man at great heights** (Herrligkoffer), 8.6-105; **Desert bioclimatology** (Bagnold), 8.6-338.

8.6-340

551.586:581.5

Schwabe, G. H., **Der künstliche Erdkegel als Gegenstand der experimentellen Ökologie**. [The artificial earth cone as a subject of experimental ecology.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 8(1):108-127, 1957. 3 figs., 9 tables, 3 refs. German, English and French summaries p. 108-109. **DWB**—To investigate effect of low air temperature due to Humboldt Current and high radiation due to latitude (40°S) in S. Chile on vegetation, a number of earth cones 1-1.5 m high were built in Mininco and Valdivia for experiments on local productivity and natural settlement. Yields on different sectors of cones and surrounding ring surfaces are tabulated and studied statistically. *Subject Headings:* 1. Plant ecology 2. Chile.—*C.E.P.B.*

8.6-341

551.586:61 551.582.2(71)

Robinson, John Lewis (*Univ. of British Columbia, Vancouver*), *Climate and man*. Presented at the 19th Annual Meeting, Western Snow Conference, Victoria, B. C., April 20, 1951. Ft. Collins, Colo., Oct. 1951. 12 p. DWB—A geographer's account of the factors in Canadian climate most important to human activity in general. The southern portion where half the population lives in 2% of the area (of Canada) is mostly situated in a favorable climate and most of the people live where mean summer temperature is $>60^{\circ}\text{F}$ and Jan. mean temperature $>0^{\circ}\text{F}$. Over 60% of the area has $<20''$ precipitation. However, the variability is great, especially in the cold season, from day-to-day and from year-to-year, as well as across Canada. HUNTINGTON's ideas on superiority of climates such as in S.W. and S.E. Canada, for human activity are evoked. Finally, the climate of Northern Canada is discussed. *Subject Headings:* 1. Climate of Canada 2. Human activity 3. Canada.—M.R.

8.6-342

551.586:612.5:636

Schmidt-Nielsen, Knut, *Heat regulation in small and large desert mammals*. (In: Institute of Biology, London, *Biology of deserts*. London, 1954. p. 182-187. 3 figs., 2 tables.) DWB—The author discusses the mechanism of body heat regulation in the kangaroo rat, the rate of evaporation found under actual desert conditions in mammals of different body sizes, the relation between body size and evaporation rate, the role of surface circulation through fur or clothing in heat regulation and the effectiveness of heat dissipation from the skin surface by means of evaporation of water. Tables giving the evaporation in different animals calculated from the assumption that the water loss necessary to keep the body temperature constant under desert conditions is 0.6 kg/m^2 of body surface per hour and evaporation from donkey, dog and man observed under actual desert conditions are included. Graphs showing heat gain from a hot environment in nude and clothed men and the relationship of evaporation to body size and a diagram of the temperature gradients within the surface of an animal are presented. *Subject Headings:* 1. Animal bioclimatology 2. Body heat regulation 3. Desert animals.—I.L.D.

UPPER AIR CLIMATOLOGY

See: Upper air wind variations, Tateno (Kawamura), 8.6-267.

ENVIRONMENTAL INFLUENCES

See: Climate modification by man (Heyer), 8.6-20; Modification of the wind and water regime (L'vovich), 8.6-94; Soil water economy in forests (Stålfelt), 8.6-95; Wind structure over Vienna (Toperczer), 8.6-250.

SYNOPTIC CLIMATOLOGY

8.6-343

551.589:551.515

Gião, Antonio (*Paris*) and Ferreira, M. (*Lisbon*), *Introduction à la climatologie dynamique de l'Amérique du nord, de l'Atlantique nord et de l'Europe*. [Introduction to a dynamic climatology of North America, the Atlantic and Europe.] *Geofisica Pura e Applicata*, Milan, 34:101-150, 1956. 30 figs., table, 16 refs., 110 eqs. French and English summaries, p. 101. DLC—In this paper the theory of perturbations, previously developed by one of us, is applied to the deduction of the chief normal characteristics of the perturbations that are compatible with a given mean field of pressure and temperature. This analysis comprises the determination: 1) of the mean configuration of the perturbations for the different regions under examination; 2) of the normal deepening and filling regions of the perturbations, and particularly their formation and vanishing focuses; 3) of the mean paths, speeds, frequencies and amplitudes of the perturbations. The "dynamical climatology" we are contemplating here is concerned with all these mean properties of the perturbations for a given period. After a first theoretical part, we give some examples of the application of the general results to the dynamical climatology of Jan. and July for North America, North Atlantic and Europe. *Subject Headings:* 1. Dynamic climatology 2. Statistical forecasting of atmospheric disturbances.—Authors' abstract.

MISCELLANEOUS

SOLAR INFLUENCES

See: **Drift of E layer** (Harang, Pedersen), 8.6-182; **Meteor shower-rainfall relationships** (Bowen), 8.6-293; **Eclipse effects on ionosphere** (Bates, McDowell), 8.6-352; **Meteor ionization trails** (Eshleman), 8.6-353.

VISIBILITY

See also: **Light attenuation at night** (Stewart), 8.6-113; **Visibility in clouds** (Eldridge), 8.6-276.

8.6-344

551.591:551.576.4

*Reshchikova, A. A. and Tonkova, Z. V., *O svyazi vysoty nizhnei granitsy oblakov s dal'nost'iu vidimosti*. [The relation between the height of the cloud base and visibility.] Leningrad. *Tsentral'naiia Aerologicheskaiia Observatoriia*, No. 7:16-21, 1952. 9 tables. **DLC**—The authors examine the relationship between the height of the cloud base and the horizontal visibility for stratus clouds up to 150 m. It was found that for stratus clouds, no relationship exists between the height of the lower cloud boundary and horizontal visibility; these clouds always permit good visibility. On the case of *Ns-FrnB* clouds, the relationships between cloud height and horizontal visibility is very slight being expressed only at moderate heights, but only in the case of *FrnB* clouds. The data on cloud heights and visibility are presented in tables. *Subject Headings*: 1. Cloud height-visibility relationships 2. Cloud height 3. Horizontal visibility.—*I.L.D.*

OPTICAL PHENOMENA

8.6-345

551.593.1

Abnormal Refraction [in the] English Channel [and] Western approach to Irish Sea, [and] Western Mediterranean Sea [and] Bass Strait. *Marine Observer*, 27(175):13-14, Jan. 1957. figs. **DWB**—Jan. 4, 1956, distorted sunrise in English Channel, Jan. 8, 1956, mirage of ship and of Cape Clear. March 15, 1956, in Western Mediterranean, distorted horizon. Jan. 8, 1956, inverted mirage of ship in Bass Strait. *Subject Headings*: 1. Refraction phenomena 2. Mirages.—*C.E.P.B.*

8.6-346

551.593.12

Scintillation [in the] Arabian Sea. *Marine Observer*, 27(175):12-13, Jan. 1957. **DWB**—March 12, 1956, scintillation and color changes, red, green, blue, in cycles of about 1 sec in rising star Arcturus. Phenomena lasted 2 hrs. *Subject Headings*: 1. Scintillation 2. Astronomical refraction 3. Arabian Sea.—*C.E.P.B.*

8.6-347

551.593.51

Red and green flashes at sunset [in the] North Atlantic Ocean. **Green flash** [in the] South Atlantic Ocean [and] Red Sea [and] North Pacific Ocean. *Marine Observer*, 27(175):14-15, Jan. 1957. figs. **DWB**—Various observations of green (or blue) flash at sunset and green flash at setting of Venus. *Subject Heading*: 1. Green flash.—*C.E.P.B.*

8.6-348

551.593.63

Dietze, Gerhard, *Halobeobachtungen*. [Halo observations.] *Zeitschrift für Meteorologie*, 10(10):319, Oct. 1956. fig., 2 refs. **DLC**—Sept. 20, 1956, at Gotha, in patchy *CiSt* a light pillar, mock sun ring, mock suns outside 22° halo and at 120°. Phenomena are explained simply. *Subject Heading*: 1. Halo observations.—*C.E.P.B.*

8.6-349

551.593.63

Moiseev, A. P., *Slozhnoe galo redkikh form*. [Complex halo of unusual forms.] *Priroda*, Moscow, 44(11):114, Nov. 1955. **DLC**—A description with the aid of a diagram of a complex

halo observed in Moscow, March 18, 1954 between 1500 and 1600 hrs with the sun 25° above the horizon. The paranthelia situated over the northern part of the horizon with part of the parhelic arc were visible clearly at 1700 h when the entire western horizon was covered with clouds and the brightest portion of the halo closest to the sun were scarcely perceptible. *Subject Headings: 1. Halo observations 2. Parhelia 3. Moscow, U.S.S.R.—I.L.D.*

ELECTRICAL PHENOMENA

See also: Radioactive fallout (List), 8.6-26; *Ionospheric electron density distr.* (Kelso), 8.6-183; *Multiple charge ions* (Nolan, O'Connor), 8.6-277; *Charged nuclei* (Sikсна), 8.6-280.

8.6-350

551.594.11:550.34

Bonchkovskii, V. F., *Izmeneniia gradienta elektricheskogo potentsiala atmosfery kak odin iz vozmozhnykh predvestnikov zemletriaseniĭ*. [Change in the electrical potential gradient of the atmosphere as one of the possible precursors of earthquakes.] *Akademiia Nauk SSSR, Geofizicheskii Institut, Trudy*, No. 25(152):192-206, 1954. 11 figs., refs. **DLC**—Observations in a seismically active region of Tadzhikistan indicate that in the case of weak earthquakes no variations were observed in the electric potential gradient in the hours preceding the earthquake. In the case of earthquakes with a strength of 4-6 balls there is a possibility that disturbances in the electric potential gradient at points closest to the epicenter precede the earthquake. Records of daily variations in electric potential gradient of the atmosphere on days with earthquakes from 5 seismic stations are presented. *Subject Headings: 1. Atmospheric potential gradient 2. Earthquake effects 3. Tadzhikistan, U.S.S.R.—I.L.D.*

8.6-351

551.594.11

Gandolfo, Salvatore, *Sul regime di variazione diurna del potenziale del campo elettrico atmosferico normale, a Messina*. [The regime of daily variation of the potential of normal atmospheric electric field at Messina.] *Annali di Geofisica*, Rome, 8(3):315-324, July 1955. 4 fig. (2 folded), table, 17 refs. **DWB, DLC**—Observations made during the course of an investigation having the purpose of determining, in the outskirts of Messina, the diurnal variations of the potential of the atmospheric electric field, under normal conditions, are discussed. *Subject Headings: 1. Diurnal potential gradient 2. Messina, Italy.—Author's abstract.*

8.6-352

551.594.12:551.510.535:551.590.24

Bates, D. R. and McDowell, M. R. C., *Recombination in the ionosphere during an eclipse*. *Journal of Atmospheric and Terrestrial Physics*, 10(2):96-102, Feb. 1957. 2 figs., 3 tables, 12 refs., 26 eqs. **DWB**—Calculations are carried out to determine how the electron concentration in a layer in which there are two species of ion, with different recombination coefficients, varies during an eclipse. The variation exhibits several features of interest. In particular, the minimum electron concentration is reached sooner after totality than it is in the case of a layer which decays to the same extent but which contains only one species of ion. *Subject Headings: 1. Ion recombination 2. Eclipse effects on ionosphere.—Authors' abstract.*

8.6-353

551.594.12:551.590.25

Eshleman, R. Von, *The theoretical length distribution of ionized meteor trails*. *Journal of Atmospheric and Terrestrial Physics*, 10(2):57-72, Feb. 1957. 13 figs., 16 refs., 21 eqs. **DWB**—Lengths of ionization columns formed by meteors are found to depend on the mass of the meteor and its angle of approach (radiant) into the upper atmosphere. Modal trail length is estimated as 12 sec ζ km for sporadic meteors and 17 sec ζ for shower meteors, where ζ is zenith angle of radiant. Most likely trail length for sporadic meteors is 15 km, but detection by a radar system favors longer trails, and most likely length of trails detected by a radar system with broad-beam antenna is about 25 km, in agreement with experiment. *Subject Heading: 1. Meteor ionization trails,—From author's abstract.*

8.6-354

551.594.13:550.384.4

Maeda, Hiroshi (*Kyoto Univ., Geoph. Inst.*), **Daily variations of the electrical conductivity of the upper atmosphere as deduced from the daily variations of geomagnetism. Pt. 1, equatorial zone.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 9(3):148-165, Sept. 1955. 10 figs., 3 tables, 17 refs., 38 eqs. **DLC, DWB**—Daily variations of the electrical conductivity of the upper atmosphere at the equatorial one are discussed on the basis of rich materials from Huancayo Observatory on daily magnetic variations by means of a method originated by M. HASEGAWA. The daily variations of the electric field and the zero level of the daily magnetic variations are also examined. The following results are of special interest: (1) the night-time conductivity is about one-tenth of the noon conductivity. (2) While the ratio of the semidiurnal amplitude to the diurnal is about one-half in the observed magnetic variations at Huancayo, it is reduced to more or less one-seventh in the calculated variation of the electric field. (3) The zero level of the daily magnetic variations is lower than the daily mean value by about 45% of the diurnal amplitude, consequently it may be suggested that the westward maximum current intensity near midnight is about one-tenth of the eastward maximum intensity near noon in the case of S_q , but the former near sunset is about one-fifth of the latter near noon in the case of S_a . **Subject Headings:** 1. Diurnal electrical conductivity variations 2. Diurnal geomagnetic variations.—*Author's abstract.*

8.6-355

551.594.13

Smith, L. G. and Schilling, G. F. (*both, Inst. of Geophysics, Univ. of Calif. at L. A.*), **The variation of electrical conductivity of air within sealed rooms.** *Journal of Atmospheric and Terrestrial Physics*, London, 4(6):314-321, 1954. fig., 2 tables, 5 refs., 7 eqs. **DWB**—The electrical conductivity of air within sealed rooms has been found to increase regularly, with some fluctuations superimposed, towards a limiting value. This variation is compared with Schweidler's theory of ion-equilibrium and the increase in conductivity attributed to a decrease in Z , the total concentration of nuclei. It is deduced that the rate of change of Z can best be represented by $dZ/dt = -\varphi Z^{3/2}$, where φ is a constant with the value $2.5 \times 10^{-7} \text{ cm}^{3/2} \text{ sec}^{-1}$. This equation is shown to be close to that obtained by NOLAN from direct observations of nuclei. **Subject Headings:** 1. Electrical conductivity of air 2. Ion equilibrium.—*Authors' abstract.*

8.6-356

551.594.14:551.578.11:623.454.8

Watanabe, M., **On the artificial radioactive rain water observed at Sendai from April to August 1955.** *Journal of Meteorological Research*, Tokyo, 8(3):130-137, March 1956. 8 figs., 4 refs., 24 eqs. In Japanese; English summary p. 130. **DWB, DLC**—Since experiments of atom and hydrogen bomb explosions were carried out in the U. S. and U.S.S.R., rain containing radioactive substances has been observed all over Japan. The author of this paper studied the characteristic features of radioactive rainwater using data from April 1 to August 10, 1955. A relation between activity in rainwater and the amount of precipitation is deduced by assuming a model of the floating layer of radioactive dust particles in the air. This relation agrees comparatively well with observation. The decay of radioactivity of rain water is not an exponential function of time but shows a curve consisting of the three processes: (1) $t^{-\alpha}$, (2) exponential and (3) t^{β} . **Subject Headings:** 1. Radioactivity of rain water 2. Atomic explosion products 3. Sendai, Japan.—*Author's abstract.*

8.6-357

551.594.2:551.576.11

Fitzgerald, Donald R., **Theoretical and experimental studies of convective cloud electrification.** Chicago Univ. Dept. of Meteorology, Contract AF 19(604)-1552, Cloud Electricity Scientific Report, No. 1, June 15, 1956. 92+4 p. 47 figs., tables, 25 refs., numerous eqs. **DWB**—Theoretical studies and measurements pertaining to convective cloud electrification form the basis of this report. The theoretical material includes a study of the validity of monopole charge solutions and a complete discussion of the properties of a new mathematical model of cloud bipolar charge distributions. Studies of cloud electrical effects as measured

with a ground network of field meters, or with aircraft wing-tip field meters, are described in detail. It is found that small trade-cumulus and growing cumulus-congestus all-water clouds indicate an excess of negative charge in updraft columns. This charge is probably associated with regions of locally high liquid water content in the cloud. Large convective clouds, including some observed to contain solid precipitation in the form of graupel, snow pellets, or heavy snow, developed strong positive charge concentrations in their upper portions. Weak positive charges were found low in these clouds in the leading edge of heavy rain sheets. *Subject Heading: 1. Convective cloud electrification.—Author's abstract.*

8.6-358

551.594.2

Smith, L. G., **Intracloud lightning discharges.** *Royal Meteorological Society, Quarterly Journal*, 83(355):103-111, Jan. 1957. 5 figs., 2 tables, 7 refs. DWB—Slow field changes during thunderstorms were recorded at two stations 13.2 km apart in central Florida in July and Aug. 1955. Examples are shown; 69% were simple, 14% had one turning point, 13% two, and 4% more than two. The same cloud discharge may give different types at the two stations. The types are discussed in terms of charge movement within the cloud; in 39 cases out of 54 discharge was of a positive dipole, and in 30 it involved raising the negative charge. *Subject Headings: 1. Lightning discharge fields 2. Thundercloud polarity.—C.E.P.B.*

8.6-359

551.594.21

Aliverti, Giuseppina, **Sopra due fenomeni di elettricità temporalesca.** [Two phenomena of thunderstorm electricity.] *Geofisica e Meteorologia*, Genoa, 3(6):138-139, Nov./Dec. 1955. DWB—Two special lightning phenomena observed by the author are reported. The first is a clearly discernible lightning stroke from the top of a thundercloud toward a perfectly clear sky. Watching a cumulonimbus from the distance, the author observed repeated occurrence of this phenomenon at Pavia on June 10, 1943, and again with a cumulonimbus at least 7-8 km high at Somma Lombardo on Aug. 21, 1953. The second phenomenon is a thunderstorm with lightning activity directed almost exclusively from cloud to earth. This was observed in a small local thunderstorm at Naples on July 16, 1954 and in an extensive storm between Bologna and Milan a few days later. *Subject Headings: 1. Thunderstorm electricity 2. Lightning strokes 3. Italy.—G.T.*

8.6-360

551.594.21

Appleman, H., **Comments on [Ross Gunn]: Initial electrification processes in thunderstorms.** Reply by Gunn and Additional remarks by Appleman. *Journal of Meteorology*, 14(1):89-90, Feb. 1957. 7 refs. DWB APPLEMAN disputes statement by ROSS GUNN (see 7.8-266, Aug. 1956, *MAB*) that lightning can be initiated in warm clouds, mainly by criticizing observation by H. FOSTER. GUNN justifies his statement. *Subject Heading: 1. Thunderstorm electricity.—C.E.P.B.*

8.6-361

551.594.21:551.515.4

Kano, M. (*Met. Res. Inst., Japan*), **A note on the Workman-Reynolds' theory of thunderstorm charge generation.** *Papers in Meteorology and Geophysics*, Tokyo, 5(1):47-53, April 1954. 2 figs., 7 refs., 30 eqs. DWB—WORKMAN-REYNOLDS' theory of the acquisition of charges by ice particles, falling through a region containing supercooled water droplets, is worked out in detail; the latitude distribution of charge in a region of active thunderstorm and the amount of charge on an ice particle are shown. Our results show a good coincidence with the observed values obtained by ROSS GUNN. *Subject Headings: 1. Charge generation in thunder clouds 2. Thunderstorm electricity generation. I. Gunn, Ross.—Author's abstract.*

8.6-362

551.594.22:551.508.54

Coleman, S. F., **Lightning damage to an electric-cup-generator anemometer.** *Meteorological Magazine*, London, 86(1015):25-26, Jan. 1957. 4 photos. DWB—Anemometer at Wyton, Huntingdon, was struck on July 18, 1956, during a severe thunderstorm. Photos show damage. *Subject Heading: 1. Lightning damage to anemometers.—C.E.P.B.*

8.6-363

551.594.221:551.311.5

Alekseeva, K. N., *Sled molnii*. [Traces of lightning.] *Priroda*, Moscow, 45(1):115, in. 1956. **DLC**—A description of fulgurite produced by lightning in a field of sunflowers near the village of Rosnoe, Kirovgrad Oblast, June 15, 1955 and the effect of lightning strokes upon the sunflower field and an account of the possible origin of the fulgurite and the funnel like hole under the action of lightning. *Subject Headings*: 1. Fulgurites 2. Lightning effects on soil 3. Rosnoe, U.S.S.R.—*I.L.D.*

8.6-364

551.594.222 551.508.94

Schaefer, Vincent J. (*Munitap Foundation, Schenectady, N. Y.*), *Atmospheric electrical measurements in the Hawaiian Islands*. *Geofisica Pura e Applicata*, Milan, 34:211-220, 1956. 3 figs., 5 refs. **DLC**—An exploration of the electrical properties of the atmosphere on and above the island of Hawaii, as indicated by a portable corona current unit, is described. 30 ft telescopic mast having a radioactive probe mounted on an insulated bushing and connected by shielded cable to a sensitive microammeter was used. Corona currents were measured at a number of geographic locations ranging from sea level under conditions of heavy surf to the 10,000 ft-level on Mauna Kea several thousand feet above the exchange layer, and over the land and ocean in a light plane. Observations were made under clear, cloudy and rainy conditions. Fair weather and cloudy conditions gave currents from air of earth of positive sign. With warm rain falling the currents had a negative sign and increased in value with intensity of precipitation. In several instances indications of incipient discharges similar to that observed in mild lightning-storms were noted. The island of Hawaii has many desirable features to recommend it for an extensive research program in atmospheric electricity. A simple and inexpensive approach to inaugurating such a program is suggested. *Subject Headings*: 1. Electrical discharges 2. Atmospheric electricity instruments 3. Hawaiian Islands.—*Author's abstract.*

8.6-365

551.594.223

Kapitsa, P. L., *O prirode sharovoi molnii*. [Nature of ball lightning.] *Akademiia Nauk SSSR, Doklady*, n.s., 101(2):245-248, March 1955. 7 refs. **DLC**. Issued in English translation by Consultants Bureau, N. Y., as *Soviet Research in Physics*, Collection No. 3, Paper No. 5:17-20 1956(?). 7 refs. **DWB**—The author presents a brand-new theory to explain the properties of ball lightning. Previous theories could not account for the long duration (compared with that of a nuclear cloud, 10 sec) and other energy conservation considerations. The present theory is based on the idea that ball lightning forms at one or more nodes or resonance points in ionized gas where short-wave (35-70 cm) radio frequency waves are focused, and follows these resonance points as long as conditions are favorable, being fed by the energy from the radio waves which originate in the lightning discharges from the thundercloud. This theory explains the energy balance, the fixed dimensions ($\frac{1}{4}$ the wave length, or 10-20 cm), slow motion, chains (beaded lightning), explosion when disappearing (nuclear ion clouds expand and disappear noiselessly), and penetration into buildings through walls (which are pervious to radio waves). *Subject Headings*: 1. Ball lightning 2. Radio wave theory of ball lightning.—*M.R.*

AURORAS

See also: Auroral obs. in IGY, 8.6-110; Absorption of radio waves in auroral lat. (Chapman, Little), 8.6-179.

8.6-366

551.594.5:550.3:061.3

Barlow, E. W., *Aurora observations during the International Geophysical Year*. *Marine Observer*, 27(175):36-38, Jan. 1957. **DWB**—Instructions on reporting observations on board ship. Reports of possible tropical aurora are especially needed. *Subject Heading*: 1. IGY aurora program.—*C.E.P.B.*

8.6-367

551.594.5:550.385

Rodewald, M. and Breitzkreutz, Egon, *Das grosse Nordlicht vom 21. Januar 1957*. [The great aurora borealis of Jan. 21, 1957.] *Wetterlotse*, No. 113:48-54, Feb. 1957. 4 figs. **DLC**

-In 36°17'N 6°46'W a red aurora penetrated by white rays. It was also seen in Portugal, Greece, Austria, Germany, etc. In Sweden strong magnetic disturbances caused traffic interruptions. Radio signals were inaudible. An aurora of Nov. 9, 1956 in 33°N 60°W is also referred to. *Subject Headings:* 1. Auroral observations 2. Geomagnetic disturbances.—*C.E.P.B.*

8.6-368

551.594.51:546.292

Bates, D. R.; McDowell, M. R. C. and Omholt, A., **On the energy distribution of secondary auroral electrons.** *Journal of Atmospheric and Terrestrial Physics*, 10(1):51-53, Jan 1957. fig., 5 refs., eqs. **DWB**—Report of calculations of proton impact on neon, which is sufficiently similar to oxygen and nitrogen. "It is seen that a considerable proportion of the secondary electrons of very energetic protons are able to excite spectral lines originating from high levels, and to liberate tertiary electrons." *Subject Heading:* 1. Auroral neon lines.—*C.E.P.B.*

SFERICS

See: Detection of ionized hydrogen in outer atmosphere (Storey), 8.6-189.

RADIO METEOROLOGY

See also: Radar angels (Plank), 8.6-28.

8.6-369

621.396 551.594.7

†Muchmore, R. B. and Wheelon, A. D. (both, *Guided Missile Research Div., Ramo-Woolridge Corp., L. A.*), **Line-of-sight propagation phenomena, Pt. 1, Ray treatment.** *Institute of Radio Engineers, N. Y. Proceedings*, 43(10):1437-1449, Oct. 1955. 9 figs. numerous refs., 55 eqs. **Pt. 2, Scattered components, Ibid.**, p. 1450-1458. 10 figs., refs., 55 eqs. **DLC**—The effect of variations in index of refraction on line-of-sight propagation of electromagnetic waves in the troposphere is investigated using, in Pt. 1, a ray theory approach. Mean-square variations in phase delay and phase correlation between two paths are calculated. It is shown that these quantities are relatively insensitive to the form of space correlation function assumed for the index of refraction. The mean-square phase is proportional to $\overline{\Delta N^2} l_0$ where l_0 is scale length and $\overline{\Delta N^2}$ the mean-square variation in index of refraction, whereas in beyond line-of-sight propagation the received power is proportional to $\overline{\Delta N^2}/l_0$. Variations in angle of arrival are also calculated and it is shown that here the assumed space correlation of index of refraction is critical in determining the angle of arrival characteristics. It is shown however, that a certain portion of the angle-of-arrival spectrum is insensitive to the choice. In Pt. 2 the foregoing investigation of line-of-sight propagation through a turbulent atmosphere is continued and enlarged. Generalizations of the ray calculation to include scattering contributions by off-axis blobs are given. It is found that the previous expressions for rms phase errors are substantially maintained. The dependence of these fluctuations on receiving antenna beamwidth is adduced. These techniques are then applied to estimate phase scintillation for transmission through a rainstorm. Meteorological data are used to relate such errors to rainstorm. Meteorological data are used to relate such errors to rainfall intensity and infer scintillation frequency spectra. Numerical values for these effects are given for representative atmospheric conditions. *Subject Headings:* 1. Radio propagation computations 2. Refraction of electromagnetic waves.—*Authors' abstract.*

8.6-370

551.594.7:535.3:551.593.1

Wolin, Samuel (*U. S. Naval Air Dev. Center, Johnsville, Pa.*), **Ray deflection through a medium having a continuously varying refractive index.** *Optical Society of America, Journal*, 43(5):373-375, May 1953. 2 figs., foot-refs., 28 eqs. **DLC**—A method is outlined for computing for computing the ray deflection through a medium having a continuously varying refractive index. General equations are developed by applying the calculus of variations to Fermat's principle of optics. These equations are applied to the case of a dielectric material having a linear variation with distance in its refractive index and also to the case of a foam

dielectric having a linear variation in density. A set of universal curves is presented for the case of a plane dielectric sheet having a linearly varying dielectric constant. The general equations presented here can also be applied to the design of lenses and optical devices having a continuously varying refractive index. *Subject Headings: 1. Refraction of light 2. Tropospheric propagation.*—*Author's abstract.*

ACOUSTICAL PHENOMENA

8.6-371

551.596:534.6

Franken, Peter A. (*M.I.T.*). **Theoretical analysis of the field of a random noise source above an infinite plane.** *U. S. NACA, Technical Note*, No. 3557, Nov. 1955. 20 p. 3 figs., 22 refs., 27 eqs. **DWB, DLC** The sound field about a random noise source above a plane as measured by a receiver with finite band width is studied theoretically. For simplicity, only the far field is considered. The special case of a perfectly reflecting plane is discussed first and the analysis is then extended to include the case of a plane of arbitrary impedance. *Subject Heading: 1. Acoustics.*—*Author's abstract.*

PART II. ANNOTATED BIBLIOGRAPHY ON NUMERICAL FORECASTING (SUPPLEMENT, 1954-1957)

By: Geza Thuronyi

INTRODUCTORY NOTE

This supplementary bibliography contains material which has appeared since the publication of our first bibliography on **Numerical Forecasting** in the June 1954 issue of *MAB*. Many of the items included herein have been published in earlier issues of *MAB*. However, not all abstracts on numerical forecasting published in *MAB* since June 1954 are being repeated here. Most of the references to articles dealing with numerical forecasting in general rather than with specific problems and experiments, have been omitted and will be found in other issues of *MAB* under index numbers 5.10-89, 5.10-90, 5.11-51, 6.5-69, 6.6-107 to 109, 6.7-28, 6.9-116, 6.11-39, 6.11-147, 6.11-151, 7.2-99 to 101, 7.4-116, 7.6-91 to 93, 7.6-114, 7.7-114, 7.9-107, 7.9-109, 7.10-94, 7.10-101, 7.10-104, 7.10-106, 7.11-139, 7J-181, 8.1-167, 8.3-122, 8.5-109, 8C-64, etc.

Due to the shortness of the period covered (1954-57) an alphabetical arrangement by author has been chosen in preference to a chronological one. Wherever several items are listed, each written by the same author, they have been arranged chronologically.

Reference to the particular aspects covered will be found in the following outline of subjects.

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8F-1

551.509.312:551.511.6

Adem, Julián (*International Met. Inst. of Stockholm*). A series solution for the barotropic vorticity equation and its application in the study of atmospheric vortices. *Tellus*, Stockholm, 8(3):364-372, Aug. 1956. 4 figs., table, 4 refs., 16 eqs. **DLC**—A method to obtain a series solution for the barotropic nondivergent, vorticity equation is given and is applied to the case of a vortex. A formula that gives the development of a symmetrical vortex as a function of radius, maximum velocity and latitude is obtained. A numerical example is worked out. The convergence of the series solution for the general case is discussed and shown to depend on the scale of motion to be forecast and conclusions are drawn regarding time-steps used in a forecast and the smoothing of the initial map. The possibility of improving a forecast and reducing the number of time-steps used in it by the application of this series solution, follows as a general conclusion. Finally, a theorem

that gives the scaling of the variables in an experimental model of a barotropic flow is obtained
Subject Headings: 1. Numerical forecasting 2. Vorticity equations.—*Author's abstract.*

8F-2

551.524.4:551.509.31

Årnason, Geirmundur and Vuorela, L. (both, Stockholm Univ.), A two-parameter representation of the normal temperature distribution of the 1,000–500 mb layer. *Tellus*, Stockholm, 7(2):189–203, May 1955. 10 figs., 13 refs., 5 eqs. **DLC**—Height normals for 1000, 700 and 500 mb, published by U. S. Weather Bureau, have been used to study the normal temperature fields of the 1000–500 mb layer by means of a simple model. In this model the normal temperature-height curve is replaced by one having a temperature lapse-rate independent of height in such a way that the thicknesses of the sub-layers 1000–700 and 700–500 mb are correctly represented by the model. As a consequence the temperature as well as its horizontal gradient and the thermal wind all have a linear variation with height and may be described in terms of two parameters, the temperature lapse-rate k and "representative" 1000 mb temperature τ_0 . Hemispheric maps for these parameters as well as the thermal wind at 1000 and 500 mb have been prepared for the months Jan. and July. The major frontal zones of the atmosphere appear clearly on the τ_0 -maps in position which agree essentially with those shown earlier by a number of meteorologists. The July map reveals, however, a strong baroclinic zone in high latitudes, surrounding the polar cap, not shown clearly in earlier presentation of the low-level baroclinicity. The k -charts disclose large horizontal variation in the temperature lapse-rate, and the charts for the thermal wind show that its variation with height is very pronounced in middle and high latitudes. (Same item as 7.5–157, May 1956, MAB.) *Subject Headings:* 1. Vertical temperature gradient 2. Numerical forecasting 3. Northern Hemisphere normal temperature charts.—*Author's abstract.*

8F-3

551.509.31

Årnason, Geirmundur (U. S. W. B., Wash., D. C.), Results of 24-hour barotropic forecasts for the 100 mb pressure surface. *U. S. Joint Numerical Weather Prediction Unit, Technical Memorandum*, No. 8, Oct. 14, 1955. 7 p. 3 figs., 3 refs. **DWB**—In barotropic forecasts the divergence term in the vorticity equation is omitted. As horizontal divergence is small in the stratosphere it may be assumed that barotropic forecasts will be particularly successful at that level. To test this hypothesis 34 forecasts for 100 mb and 60 for 500 mb were prepared for 24 hrs in one-hour time steps. Correlation coefficients (R), root mean square errors (σ_E), root mean squares of observed (σ_0) and predicted (σ_F) height changes and the ratios σ_E/σ_0 were computed and are tabulated with the following general results: (1) R and σ_E are practically the same for 100 and 500 mb; (2) σ_0 at 100 mb was $\frac{2}{3}$ of the value at 500 mb; consequently σ_E/σ_0 was larger at 100 mb and (3) there was no systematic difference between σ_0 and σ_F at 100 mb. *Subject Headings:* 1. Numerical forecasting 2. Barotropic models.—*G.T.*

8F-4

551.509.312

Årnason, Geirmundur, Convergence rates of Liebmann's and Richardson's iterative methods when applied to the solution of a system of Helmholtz'-type equations. *U. S. Joint Numerical Weather Prediction Unit, Technical Memorandum*, No. 10, July 16, 1956. 26 p. fig., 3 refs., numerous eqs. **DWB**—S. P. FRANKEL's (1950) theory for convergence rates of Richardson's and Liebmann's Iterative Methods has been extended for use in numerical prediction of one and two level models. The paper gives, in Ch. 2, the theoretical derivations of FRANKEL, and then discusses "convergence criterion and determination of optimum over-relaxation coefficients when applying Richardson's and Liebmann's Iterative Methods to numerical solution of a high order linear system." In the 3rd chapter FRANKEL's theory is extended to the special case $m=2$, and in the last chapter to an arbitrary m . *Subject Headings:* 1. Numerical forecasting 2. Relaxation methods.—*M.R.*

8F-5

551.509.312

Årnason, Geirmundur, A convergent method for solving the balance equation. *U. S. Joint Numerical Weather Prediction Unit, Suitland, Md.*, Jan. 10, 1957. 15 p. fig., 8 refs., 17 eqs. **DWB**—The non-linear balance equation is replaced by an infinite system of linear differential equations. This system renders a series of solutions which under certain conditions converge toward the solution of the balance equation. It is shown that these conditions coincide with the conditions for ellipticity of the balance equation. A slightly different method is shown to diverge. This is illustrated by a case where the sequence of approximate solutions is compared with the solution of the balance equation. *Subject Headings:* 1. Numerical forecasting 2. Balance equation.—*Author's abstract.*

8F-6

551.509.312

Aubert, Eugene J., A multi-level baroclinic model applicable to numerical prediction. *Journal of Meteorology*, Boston, 13(2):207–211, April 1956. 8 refs., 33 eqs. **DWB**—A system of differential

quations of motion in a nonlinear baroclinic model is developed. Equations are evolved suitable for numerical forecasting of the height and vertical motion of various pressure surfaces. (*Same item as 7.9-106, Sept. 1956, MAB.*) *Subject Headings:* 1. Numerical forecasting 2. Baroclinic models.—C.E.P.B.

8F-7

551.509.312

Bergthórsson, P.; Döös, B. R.; Fryklund, S.; Haug, O. and Lindquist, R., **Routine forecasting with the barotropic model.** *Tellus*, 7(2):272-274, May 1955. 3 figs., 3 tables, ref. Comments by W. H. Best, *Ibid.*, 8(1):115-116, Feb. 1956. table. **DLC**—Some results of the test forecasts conducted in Stockholm on the BESK computer are reported. The method of verification by an objective method of correlation coefficients and a subjective method involving evaluation of prognostic value by a board of six meteorologists is discussed and its results are tabulated. Cases of successful application of numerical prediction in daily forecasts are mentioned. Best comments on the problem of forecast verification. *Subject Headings:* 1. Numerical forecasting 2. Forecast verification 3. Barotropic models.—G.T.

8F-8

551.509.312

Bergthórsson, Páll (*Icelandic Weather Service, Reykjavik*) and Döös, B. R. (*Univ. of Stockholm*), **Numerical weather map analysis.** *Tellus*, Stockholm, 7(3):329-340, Aug. 1955. 9 figs., 3 tables, refs., 15 eqs. **DLC**—A method to analyze upper air charts numerically is presented. The analysis is expressed by the height values of the pressure surface in gridpoints. The computed height in a gridpoint is obtained as a weighted mean of height values derived from the surrounding height and wind observations, the forecast height in the point and the corresponding normal height. Nine 00 mb maps are analyzed with the aid of the Swedish computer BESK, six of these consecutive. The size of the grid was 32×41 points. The analyses have been compared with two independent conventional analyses. The mean values of the root mean square of the differences between the numerical and the conventional analyses were 26 m and 24 m, respectively, and 26 m between the two conventional ones. The root mean square of the differences between the observed and analyzed heights was 22 m in the mean. This is roughly what should be expected judging from the existing knowledge about observation errors. Three barotropic forecasts have been computed from the numerical analyses. They are compared with the corresponding numerical forecasts from conventionally analyzed maps. It was not possible to find any significant difference between the goodness of the forecasts based on the numerical analyses and the conventional analyses. (*Same item as 7.10-98, Oct. 1956, MAB.*) *Subject Headings:* 1. Numerical forecasting 2. Synoptic analysis 3. Forecast verification.—Authors' abstract.

8F-9

551.509.312

Berkofsky, Louis, **The exact determination of the effective domain of dependence of a one-dimensional numerical prediction formula.** *Tellus*, Stockholm, 6(2):165-169, May 1954. fig., refs., 31 eqs. **MH-BH**—By assuming sinusoidal initial conditions, an exact expression for determining the "cut-off" point of a one-dimensional influence function is derived. From this result one may construct tables of percent error incurred by terminating the influence function at various distances. (*Same item as 6.11-140, Nov. 1955, MAB.*) *Subject Headings:* 1. Numerical forecasting 2. Barotropic models.—Author's abstract.

8F-10

551.509.312

Berkofsky, Louis, **A three-parameter baroclinic numerical-prediction model.** *Journal of Meteorology*, 13(1):102-111, Feb. 1956. table, 3 refs., 71 eqs. **Correction.** *Ibid.*, 14(1):93-94, Feb. 1957. eqs. **DWB**—From the premise that the modelling approximation for an integrated numerical-prediction model is given by a constraint on the stability factor in the first law of thermodynamics for adiabatic flow, a three-parameter baroclinic model is devised. The resulting flow equations contain development terms which reflect interaction between surface and 500-mb effects. It is shown that the three-parameter model is a natural outgrowth of an attempt to render two-parameter models internally consistent. (*Same item as 7.8-98, Aug. 1956, MAB.*) *Subject Headings:* 1. Numerical forecasting 2. Baroclinic models.—Author's abstract.

8F-11

551.509.312

Best, William H. (*U.S.A.F.*), **Differences in numerical prognoses resulting from differences in analyses.** *Tellus*, Stockholm, 8(3):351-356, Aug. 1956. 9 figs., 3 refs. **DLC**—Three synoptic cases (Dec. 3, 8, and 15, 1954) were picked at random (ahead of time) for comparison of the routine analyses of the Deutscher Wetterdienst, Frankfurt and the Royal Swedish Air Force, Stockholm, Weather Central. It was found that differences in analysis were great enough to materially affect the 48 hr and 72 hr forecasts made with the barotropic model by the BESK computer in Stockholm. Differences are partially due to boundary assumptions, to the shape of ridges, troughs, lows, etc.,

as much as to the location of these features and to the sparsity of the fixed observing network over the N. Atlantic. Details of differences in analyses and resulting 24, 48 and 72 hr prognoses are discussed and illustrated by means of 500 mb observed and prognostic charts for the 3 situations. *Subject Headings:* 1. Numerical forecasting 2. Upper-air analysis 3. Forecast verification 4. Barotropic models.—M.R.

8F-12

551.509.1

Bigelow, Julian and Gilchrist, Bruce, **Data transmission for numerical weather prediction**. *American Meteorological Society, Bulletin*, 36(8):417-418, Oct. 1955, table, 3 refs. DWB—The authors discuss the problem of making a data gathering and transmission process efficient from an information, theoretic and coding viewpoint. Efficiency is obtained by removing redundancy from data, and by choice of an optimum code language and distributions of messages over full combination possibilities. The application of these codes to the testing of a numerical weather prediction technique, utilizing a high speed electronic computer in simulated actual service by determining the additional transmission burden the test would require, is illustrated. *Subject Headings:* 1. Transmission of data 2. Meteorological codes 3. Numerical forecasting.—I.L.D.

8F-13

551.509.312:551.511:551.513.1

Blackburn, Jacob F. and Gates, W. Lawrence, **Note on hemispheric numerical integration of the barotropic model**. *Journal of Meteorology*, 13(1):59-63, Feb. 1956. 2 figs., 8 refs., 2 eqs. DWB—Numerical integration over a hemisphere was tried, to minimize the effect of boundary conditions. The procedure is described, and illustrated by barotropically computed changes of the 500 mb flow 24 hrs ahead. Agreement with observed changes is good. The errors are described those due to poor upper air data form a significant part. (Same item as 7.8-89, Aug. 1956, MAB.) *Subject Headings:* 1. Numerical forecasting 2. Barotropic models.—C.E.P.B.

8F-14

551.509.312:551.547

Bodolai, István and Bodolai, Emma [Jakus], **Megjegyzések az abszolút topográfiák számszerű előjelzéséhez**. [Some remarks on the numerical forecasting of absolute topography.] *Időjárás* Budapest, 60(3):150-158, May/June 1956. 8 figs., 3 refs., 2 eqs. Russian and English summaries p. 150. Russian translation p. XI-XVI. DLC—USPENSKIĭ's method of forecasting the 700 mb contour pattern is applied to two synoptic situations over Europe (July 17-22, 1953 and Aug. 14-19, 1954), using the vorticity factor only, and neglecting the divergence factor. The results obtained are in excellent agreement with actual synoptic development. The method cannot be directly applied to the 500 mb level. The time required for preparing a forecast is two hours using 40 points throughout Europe. *Subject Heading:* 1. Numerical 700 mb surface forecasting.—G.T.

8F-15

551.509.312:551.511:551.513.1

Bolin, Bert (Stockholm Univ.), **Numerical forecasting with the barotropic model**. *Tellus* Stockholm, 7(1):27-49, Feb. 1955. 8 figs., 3 tables, 22 refs., 58 eqs. Comment by R. Fjörtoft. *Ibid.*, 8(1):115, Feb. 1956. DLC—The experiments with numerical forecasting using the barotropic model have been continued and a number of 24, 48 and 72 hr forecasts are presented. The initial data for these forecasts covered an area of about 9000 by 12,000 km. The results indicate that the boundary influences become unimportant in the center of the area in the 24-hr forecasts but they may still cause errors in the 72-hr forecasts. In view of the approximations made, very good 72-hr forecasts have been obtained in some cases. The most successful one gave a correlation of 0.87 and a relative error of the forecast height changes of 0.58. Most of these extended forecasts should be of definite value in forecasting the weather. Large errors are, however, still obtained in some cases. The neglecting of baroclinic process is one of the reasons for these errors but it is quite obvious that the largest errors are of a different nature. Experiments are being conducted to find the sources of these errors. One line of this research is a general re-analysis of the assumptions made in deriving the barotropic model which is presented in the latter part of this paper. A number of improvements are suggested for further tests. Fjörtoft shows that there is no significant difference between values computed numerically and graphically. (Same item as 6.11-141, Nov. 1955, MAB.) *Subject Headings:* 1. Numerical forecasting 2. Barotropic models 3. Fjörtoft's graphical method —Author's abstract.

8F-16

551.509.312:551.513.1

Bolin, Bert (International Met. Inst., Stockholm), **An improved barotropic model and some aspects of using the balance equation for three-dimensional flow**. *Tellus*, Stockholm, 8(1):61-75, Feb. 1956. 5 figs., 2 tables, 9 refs., 40 eqs. DLC—A few suggestions for improving the barotropic model presented in a previous article (BOLIN, 1955, see 8F-15) have been tested. The results show that replacing the geostrophic relation by a more general balance equation improves the forecasts over 24 hrs in certain respects. Furthermore the incorporation of the effects of a stratosphere in a

very approximate way gives a better description of the behaviour of the largest scales of motion in the atmosphere. The application of the balance equation in numerical forecasting is extended to three-dimensional baroclinic flow. It is shown that the criterion of integrability of the balance equation to obtain the stream function from a knowledge of the pressure field has to be satisfied in the course of the computations to maintain elliptic character of the equations. (*Same item as 7.11-137, Nov. 1956, MAB.*) *Subject Headings: 1. Barotropic models 2. Numerical forecasting.—Author's abstract.*

8F-17

551.509.312

Boville, B. W. and Kwizak, M. (*Met. Branch, Montreal*), 500 mb prediction by graphical techniques. *Royal Meteorological Society, Canadian Branch, [Publications]*, 7(2) 21-35, Oct. 18, 1956. 3 figs., 6 refs., numerous eqs. **DWB**—Methods of graphical compilation of 500 mb prognostic charts by the Fjörtoft method modified by Petterssen's diagnostic equation for development to account for sea level cyclogenesis, and by other variations, are outlined in theory and procedures set forth for actual computation. An example, 0300Z June 11 12, 1956 is analyzed and explained in detail. *Subject Headings: 1. Numerical forecasting 2. Fjörtoft's graphical method 3. Petterssen's diagnostic development equation.—M.R.*

8F-18

551.509.312:551.513.1

†Brandejs, Stanislav, **Dynamické předpovědní metody v synoptické meteorologii; I. Sutcliffeova metoda vývoje.** [Dynamic forecasting methods in synoptic meteorology, Pt. 1, Sutcliffe's development method.] *Meteorologické Zprávy*, Prague, 5(4):94-100, 1952. 2 figs., 2 tables, 17 refs., 26 eqs. English summary p. 94. **DLC.** Also his: **Dynamic forecasting methods.** [Translation from original Czech in *Meteorologické Zprávy*, Prague, 6(3):69-71, June 1953. 3 figs., 9 refs., 16 eqs. Photostat No. 395. 8 p.] **DWB**—The first article contains basic theory of Sutcliffe's method: 1) equation of relative divergence assuming adiabatic processes and indifferent equilibrium, 2) computation of $\theta-\Delta\theta$ according to SAWYER and MATTHEWMAN, 3) numerical prediction of the absolute topography of 1000 mb and 4) effect of vertical stability on synoptic development. The second article is a review of the methods of numerical forecasting of barotropic surfaces following SUTCLIFFE, CHARNEY, HINKELMANN and SAWYER as well as previous work of the author. Application to high-speed computing machine solution of equations; grids and networks used, etc. are mentioned. (*Same item as 7.8 90, Aug. 1956, MAB.*) *Subject Headings: 1. Numerical forecasting 2. Barotropic models 3. Sutcliffe development method.—Author's abstract and M.R.*

8F-19

551.509.312:551.543

Brandejs, Stanislav; Kopáček, Jaroslav; Vitek, Vojtěch and Zikmunda, Otakar, **Prognosa přestavy synoptické situace.** [Forecasting development of the synoptic situation.] *Meteorologické Zprávy*, Prague, 7(2):37-46, 1954. 17 figs., table, 12 refs., 22 eqs. Russian and English summaries p. 37. **DLC.** Also: Photostat of Translation, No. 412, source unknown. [1955?] 20 p. 17 figs., 3 tables, 12 refs., 22 eqs. **DWB**—A method for predicting surface pressure changes is developed. The method is based on an equation derived from a simple baroclinic model of the atmosphere under the assumption that nonadiabatic processes can be neglected. By applying this method to five actual cases its value for short range and extended forecasting of synoptic development is exemplified. *Subject Headings: 1. Numerical forecasting 2. Baroclinic models.—G.T.*

8F-20

551.509.312

Brandejs, S.; Kopáček, J.; Věková, N. and Zikmunda, O. (*all, Met. Inst., Charles Univ., Prague*), **Použití Fjörtoftovy metody při konstrukci výškových předpovědních map.** [Use of Fjörtoft's method in preparing prognostic upper-air charts.] *Meteorologické Zprávy*, Prague, 10(1):23-26, 1957. 4 figs., 3 tables, 3 refs., 4 eqs. **DLC**—At the Meteorological Institute of Prague University 13 prognostic charts for 500 mb absolute topography 12 hrs ahead and 13 charts 24 hrs ahead were prepared with Fjörtoft's graphical method. A comparison of computed and actual pressure tendency for a first series of forecasts (Jan. 29-Feb. 1, 1953) gives an average of correlation coefficients of 0.60 for 12-hr forecasts and 0.50 for 24-hr forecasts. For a second series of forecasts (Jan. 15-23, 1955) the average correlations are 0.72 (12-hr) and 0.71 (24-hr). A simplification was introduced into Fjörtoft's formula in two cases and this did not impair the quality of the forecasts. The results obtained by the graphical method are also compared with those computed numerically, the superiority of the latter being attributed to the fact that the computations were not truly forecasts. Comparative charts are presented. *Subject Headings: 1. Fjörtoft's graphical method 2. Numerical forecasting.—G.T.*

8F-21

551.509.312:681.14

Buchholz, Werner, **The system design of the IBM Type 701 computer.** *Institute of Radio Engineers, New York, Proceedings*, 41(10):1262-1275, Oct. 1953. 3 figs., foot refs. **DLC**—The

IBM type 701 high-speed electronic computer which is used by the Joint Numerical Weather Prediction Unit at Suitland, Md., is described with particular attention to certain new features. High speed, large storage capacity and extensive input and output equipment are mentioned as most distinguishing characteristics of the computer. *Subject Heading: 1. IBM 701 computer.—G.T.*

8F-22

551.509.312:681.14

Bushby, F. H. and Hinds, Mavis K., *The computation of forecast charts by application of the Sawyer-Bushby two-parameter model*. *Royal Meteorological Society, Quarterly Journal*, 80 (344): 165-173, April 1954. 6 figs., table, 7 refs., 7 eqs. Also their: *Further computations of 24-hr pressure changes based on a two-parameter model*. *Ibid.*, 81 (349):396-402, July 1955. 2 figs., 5 tables, 4 refs., 5 eqs. DWB—The Sawyer-Bushby 2-layer baroclinic model (see 5F-76, June 1954), was used as a basis for 12 hr and 24 hr forecasts of 1000 and 500 mb height over Atlantic and Europe by electronic machine, using a 260 km net and time steps of 2 hr or 1 hr. Computed and observed charts are shown. Results were only slightly less good than conventional forecasts. Introducing a term for effect of heating over the sea, and estimated 600 mb heights instead of 500 mb, resulted in slight improvements. Most of the error was due to assumed constant boundary conditions. (*Same items as 5.8-67, Aug. 1954 and 6.11-153, Nov. 1955, MAB.*) *Subject Headings: 1. Numerical forecasting 2. Synoptic aerology 3. Baroclinic models.—C.E.P.B.*

8F-23

551.509.312

Bushby, F. H. and Huckle, Vera M., *The use of a stream function in a two-parameter model of the atmosphere*. *Royal Meteorological Society, Quarterly Journal*, 82 (354):409-418, Oct. 1956. 2 figs., 3 refs., eqs. Also as: *Great Britain. Meteorological Research Committee, M.R.P., No. 956, Jan. 23, 1956*. 5 p. 4 figs., 4 refs., 6 eqs. Mimeo. DWB—A better approximation to horizontal nondivergent flow than the geostrophic is derived from a Monge-Ampere type differential equation (similar to CHARNEY's) with some simplifications. This was tested by comparing the pressure field computed from the stream function with the actual. The stream function was then used for three 24-hr prognostics of the 500 mb level and 500-1000 mb thickness (Atlantic and Europe) based on the Sawyer-Bushby 2-parameter model. These were comparable with or better than forecasts without the stream function. Time by electronic computer was increased from $3\frac{1}{2}$ to 4 hrs. (*Same item as 7.10-99, Oct. 1956 and 8.2-119, Feb. 1957, MAB.*) *Subject Headings: 1. Stream functions 2. Baroclinic models 3. Numerical forecasting.—C.E.P.B.*

8F-24

551.509.313:551.509.317

Bushby, F. H. and Huckle, Vera M., *Objective analysis in numerical forecasting*. *Royal Meteorological Society, Quarterly Journal*, 83 (356):232-247, April 1957. 3 figs., table, 6 refs., 4 eqs. Also preliminary version: Huckle, Vera M., *Numerical forecasts based on objectively analysed data*. *Great Britain. Meteorological Research Committee, M.R.P., No. 1016, 30 Nov. 1956*. 5 p. 4 figs., table, 2 refs. Mimeo. DWB—This paper describes an objective technique for analyzing sets of upper-air data. The analyses resulting from the application of this technique to four sets of data for the N.E. Atlantic and Europe were compared with those produced subjectively by an analyst, and no marked differences were apparent. Numerical forecasts for twenty-four hours ahead based on both subjective and objective analyses were computed for these four situations and the results compared with the actual developments. Only slight differences were noticed between the forecasts based on the subjective analyses and those based on the objective analyses in three of the four situations, but in the fourth situation the numerical forecast based on the objective analysis was much the better. (For earlier papers on this research, see Johnson, D. H., *Objective analysis*. *Gt. Brit. Met. Res. Comm., M.R.P., 965, 1956 [8.1-172, MAB]*, and Bushby, F. H., *The objective analysis of some 500 mb charts*. *M.R.P., 986, 1956 [8.1-169, MAB]*.) *Subject Headings: 1. Numerical forecasting 2. Forecast verification.—Author's abstract.*

8F-25

551.509.312

Charney, Jule, *Introduction [to the 1954 Workshop on Numerical Weather Prediction]*. (In: *American Meteorological Society. District of Columbia Branch, Proceedings of the Workshop on Numerical Weather Prediction, Wash., D. C., June 1954*. p. 1-6. eqs.) DWB—Only modern high speed computing machines with automatic memory and control can make practical use of theoretical equations in hydrodynamics and meteorology. The advance of theory is outlined as developed by NEWTON, EULER, RICHARDSON and ROSSBY. *Subject Headings: 1. Numerical forecasting 2. History of meteorology.—A.A.*

8F-26

551.509.312

Charney, Jule, *Theoretical basis of numerical weather prediction*. (In: *American Meteorological Society. District of Columbia Branch, Proceedings of the Workshop on Numerical Weather Prediction, Wash., D. C., June 1954*. p. 7-14. 13 eqs.) DWB—The prognostically significant

livergence, attempted for use by RICHARDSON, is completely obscured by random "noise." Introducing geostrophic approximations, workable and more realistic differential equations were derived. Starting from a single layer barotropic model and introducing gradually more complicated models, a method was developed whereby cyclogenesis could be predicted with the help of high speed electronic computers. *Subject Headings:* 1. Numerical forecasting 2. Dynamics of the atmosphere 3. Cyclogenesis.—A.A.

8F-27

551.509.312:551.511

Charney, J. (*Princeton, Inst. for Adv. Study*), *The use of the primitive equations of motion in numerical prediction*. *Tellus*, Stockholm, 7(1):22-26, Feb. 1955. figs., foot-refs., eqs. DLC—An obstacle to the use of the primitive hydrodynamical equations of numerical prediction is that the initial wind and pressure fields determined by conventional means give rise to spurious large-amplitude inertio-gravitational oscillations which obscure the meteorologically significant large-scale motions. It is shown how this difficulty may be overcome by the use of a relationship between wind and pressure which enables one to determine these fields in such a manner that the noise motions do not arise. The method is illustrated by a numerically computed example. The wind-pressure relationship is in a sense a generalization of the geostrophic approximation and may be used where the latter approximation is inapplicable, either to determine initial conditions or to derive a set of filtering equations for numerical prediction analogous to the quasi-geostrophic equations. (*Same item as 6.11-142*, Nov. 1955, MAB.) *Subject Headings:* 1. Numerical forecasting 2. Equations of motion.—*Author's abstract.*

8F-28

551.509.312

Charney, J. G., *Numerical methods of dynamical meteorology*. *National Academy of Science, Wash., D. C., Proceedings*, 41(11):798-802, Nov. 15, 1955. DWB—A general review of the procedures in present day numerical methods. Achievements have been improvement in the mathematical models so that cyclogenesis can be predicted, and the increase in the speed of numerical forecasts. *Subject Heading:* 1. Numerical forecasting.—A.A.

8F-29

551.509.312:533.6

Charney, J. G.; Gilchrist, Bruce and Shuman, F. G., *The prediction of general quasi-geostrophic motions*. *Journal of Meteorology*, 13(5):489-499, Oct. 1956. 5 figs., 11 refs., 37 eqs. DWB—Methods are presented for the numerical integration of several rather general approximations to the quasi-geostrophic equations of motion. The choice of the vertical grid interval involved in these approximations is justified by scale considerations. Three of the approximations involve the integration of nonlinear partial differential equations of elliptic type, and the method of solution used is described in some detail because of its quite general applicability. The results of the integrations for each version are presented and compared with those obtained earlier from simple versions. The principal conclusion is that the prediction error is not eliminated by a more refined treatment of the quasi-geostrophic equations, but is at least partly inherent in the geostrophic formulation itself. The retention of terms that are neglected in the first-order geostrophic approximation changes the aspect of the error but does not eliminate it. (*Same item as 8.2 92*, Feb. 1957, MAB.) *Subject Headings:* 1. Numerical forecasting 2. Equations of motion.—*Authors' abstract.*

8F-30

551.509.33

Clapp, Philip F. (*U. S. W. B., Wash., D. C.*), *Practical application of the barotropic vorticity equation to extended forecasting*. U. S. Weather Bureau, Sept. 1954. 30 p. 12 figs., 16 refs. DWB—In this study an attempt is made to utilize the complete two-dimensional barotropic vorticity equations for long range forecasting. The earlier applications of vorticity principles to planetary waves are reviewed. The generalized versions of the Rossby wave formula and another equation giving "the instantaneous motion and development of centers of maximum and minimum departure from normal of upper level height contours" are presented. In an empirical section an attempt is made to determine the validity of the theoretical deductions. The derivation of formulas for motion and development of anomalous vortex centers is presented in an appendix. (*Same item as 6.11-155*, Nov. 1955, MAB.) *Subject Headings:* 1. Numerical long range forecasting 2. Barotropic models.—I.L.D.

8F-31

551.509.3:551.509.312

Clapp, Philip F., *Some considerations involved in preparing long-range forecasts by numerical methods*. *Journal of Meteorology*, 13(4):341-350, 1956. 8 figs., 18 refs., 6 eqs. DWB—The integrated vorticity equation is applied to 5-day mean charts of upper level flow over the Northern Hemisphere for numerical calculation of 700 mb flow up to 5 days ahead. The problem of monthly forecasts is then considered. It is not possible to take into account the eddy transport of vorticity, but it is considered that this may either be disregarded or statistically determined from the large-

scale circulation. A modified conservation equation may be a possible method. Results are sufficiently encouraging to suggest the lines of a continued investigation. (Same item as 7.11-144, Nov 1956, MAB.) *Subject Heading: 1. Numerical long range forecasting.*—C.E.P.B.

8F-32

551.509.312

Cressman, G. P.; Thompson, P. D., et al. (all, U. S. Joint Numerical Weather Prediction Unit) **One year of operational numerical weather prediction. Pt. 1. American Meteorological Society Bulletin**, 38(5):263-268, May 1957. fig., 6 refs. **Pt. 2, Ibid.**, 38(6):315-328, June 1957. 8 figs., 3 tables, 5 refs. **DWB**—The Joint Numerical Weather Prediction (JNWP) Unit was established by the J.M.C. on July 1, 1954; the IBM-701 computer was received at Suitland, Md., on Feb. 28, 1955 and completely installed March 17, 1955. Three parameter model forecasts were begun on a test basis on April 18, and on a daily basis for distribution on May 6 (for 900, 700 and 400 mb). On July 8, 500 and 1000 mb prognostic charts were substituted and on Sept. 29, 1955 barotropic forecasts for 24 hour intervals up to 72 hrs were begun. Data preparation procedures, the JNWP method of numerical prediction using a 3-level model and the form and content of the numerical forecasts are described. It is concluded that the quality of the numerical 500-mb forecast is comparable to that of conventional subjective forecasts, with significant improvements to be expected. Note: Baroclinic (3-level) forecasts were discontinued in the summer of 1956 and two- and then a one-level (barotropic) model substituted for the July 1956-June 1957 period (ed.). *Subject Headings: 1. Numerical forecasting 2. Baroclinic models. I. Fawcett, E. B. II. Shuman, F. G. III. Smagorinsky, J. IV. Silberman, I. V. U. S. Joint Numerical Weather Prediction Unit.*—M.R.

8F-33

551.509.312:551.511:551.513.1

Dady, G. (Obs. de Magny-les-Hameaux), **Deux aspects des prévisions numériques à l'aide du modèle barotrope.** [Two aspects of numerical forecasting with the aid of the barotropic model.] *La Météorologie*, Paris, Ser. 4, No. 37:63-76, Jan./March 1955. 6 figs., eqs. French, English and Italian summaries p. 64. **DWB**—An attempt to popularize the method of the barotropic model and to show how this method can be carried out by a numerical computer or by a technique of graphic construction. The author describes tests made at the Institute of Meteorology of Stockholm under the direction of Rossby, and gives a general explanation of the techniques of the barotropic model and a description of forecasts made with the BESK computer and the Fjörtoft graphical method. The BESK computer is illustrated, and the area analyzed by the electronic computer for numerical predictions is shown on a Northern Hemisphere chart. (Same item as 7.11-138, Nov. 1956, MAB.) *Subject Headings: 1. Numerical forecasting 2. Barotropic models 3. Fjörtoft's graphical method.*—A.M.P.

8F-34

551.509.312:681.14

Dady, G., **Remarques sur les essais de prévision numérique par la méthode "temp."** [Comments on numerical forecasting experiments by the "temp" method.] *Journal Scientifique de la Météorologie*, Paris, 7(26):241-247, April/June 1955. 2 figs., 3 refs. French, English and Spanish summaries p. 241. **DWB**—The author criticizes the method of numerical forecasting proposed by A. GIAO for use with an analog computer (see 7F-93 and 7F-109, June 1956, MAB), presents a forecast chart for Oct. 2, 1953 and barograms for Paris for June 4-7, 1953 (comparing actual with forecast barogram). In order to get a reasonable forecast, the coefficients which vary with the weather from day to day must be predicted before the formula can be applied in the TEMP calculation. The author believes that too much information is lost in the process of statistical smoothing and that this information cannot be recovered. *Subject Headings: 1. Numerical forecasting 2. TEMP calculator. I. Giao, A.*—M.R.

8F-35

551.509.312:551.547

Döös, Bo R. (International Met. Inst., Stockholm), **Automation of 500 mb forecasts through successive numerical map analyses.** *Tellus*, Stockholm, 8(1):76-81, Feb. 1956. 2+figs., table, 6 refs. **DLC**—Two series of barotropic forecasts have been computed from numerically analyzed maps at the Meteorological Inst. of the University of Stockholm. The first series consists of 31 forecasts and the second one of 4. Due to the fact that it is possible to obtain the forecasts directly from observed data, which are punched immediately after they are received, it is possible to save both time (3 to 4 hrs) and personnel. The reliability of these forecasts seem to be at least as good as forecasts computed from conventionally analyzed maps. *Subject Headings: 1. Numerical forecasting 2. Barotropic models.*—Author's abstract.

8F-36

551.509.312

Dubov, A. S., **Izmenenie davleniia vo vremeni pod vlianiem dinamicheskikh faktorov.** [Changes of pressure with time under the influence of dynamic factors.] (In: Laikhtman, D. L. (ed.), *Osnovy dinamicheskoi meteorologii*, Leningrad, 1955. p. 255-303. 6 figs., numerous eqs.)

DLC—This chapter deals with the following: derivation of the equation of vertical velocity; the relationship between the fields of mean velocity and pressure and the development of the basic equations; the solution of the linearized system of equations expressing the relationship between the field of velocity, averaged along the vertical, and pressure changes; reconstitution of the fields of velocity and pressure; variation of pressure at the earth's surface in the barotropic model; equations of the dynamics of the atmosphere in the system of coordinates x, y, p, t ; the application of the barotropic model to forecasting the relief of an isobaric surface; pattern of integrating the equation of the barotropic model for computing machines; the graphic-analytical method of integrating the equation of the barotropic model; and calculation of baroclinicity of the atmosphere by means of the vortex equation. *Subject Headings: 1. Dynamic pressure changes 2. Numerical forecasting.*—*I.L.D.*

8F-37

551.509.312:551.55:551.542

Edelmann, Winhart, *Eine nichtgeostrophische Windapproximation und ihre anwendung auf den beginnenden Okklusionsprozess*. [A nongeostrophic wind approximation and its application to the initiation of the occlusion process.] Berlin. Freie Universität. Institut für Meteorologie und Geophysik, *Meteorologische Abhandlungen*, 3-4), 1956. 80 p. 23 figs., 39 refs., numerous eqs. **DWB**—In this attempt to apply the geostrophic wind to calculate in advance weather situations it is essential to know whether any shortcomings are eliminated by its use and whether any new errors result from its application. The physical and meteorological equations describing atmospheric processes in general are summarized briefly. This is followed by an examination of the simplification of the vorticity and divergence equations and the introduction of the nongeostrophic approximation, integration of the forecasting equation, a closed solution for the case of advection, a comparison of the exact solution and results obtained geostrophically, and the meteorological expression of the results. *Subject Headings: 1. Nongeostrophic wind approximation 2. Numerical forecasting 3. Occlusions.*—*I.L.D.*

8F-38

551.509.312 551.515:551.542

Eliassen, Arnt, *Provisional report on calculation of spatial covariance and autocorrelation of the pressure field*. Norske Videnskaps-Akademi i Oslo. Institutt for Vaer- og Klimaforskning, Report, No. 5, 1954. 11 p. 5 tables, 32 eqs. **DWB**—For use in numerical prediction, values of $\bar{Z}$ (mean height of pressure surface), N (variance in dekameters), M (covariance with respect to Liverpool) and R (autocorrelation function) for 1000, 700, 500 and 300 mb surfaces for 15 stations in NW Europe (British Isles, Jan Mayen, 2 weather ships J and M, etc.) for Dec. and Jan. for 6 years 1948-54 are calculated and presented in tables with ample discussion. Variance (N) increases with height, especially in southern British Isles. Distortion in R from concentric increases with height and distance from Liverpool (especially toward west). No negative values of R were obtained. (*Same item* as 6.9-120, Sept. 1955, *MAB.*) *Subject Headings: 1. Variance in pressure field 2. Upper air correlation 3. Numerical forecasting 4. Great Britain 5. North Atlantic.*—*M.R.*

8F-39

551.509.312

Eliassen, Arnt, *A procedure for numerical integration of the primitive equations of the two-parameter model of the atmosphere*. California. Univ. at L. A., Dept. of Meteorology, Contract AF 19(604)-1286, Scientific Report, No. 4, March 1956. 53 p. numerous figs., table, numerous eqs. **DWB**—This study is "an attempt to apply a nongeostrophic forecasting technique to the simplest baroclinic model, namely the two parameter model." The errors introduced by the geostrophic approximations are eliminated by "integrating the equations in the primitive for a baroclinic model so that the solution will contain gravitational-inertial waves of the inertial type." *Subject Headings: 1. Geostrophic approximation 2. Baroclinic models.*—*I.L.D.*

8F-40

551.509.5:551.509.3

Engel, Leonard, *What we don't know about weather*. *New York Times Magazine*, Feb. 12, 1956, Section 6, Pt. 1, p. 17, 58-60. photo. **DLC**—This popular article allows that errors in forecasts are often due to forecasters mistakes, but more often to lack of knowledge of the way the various forces affecting the weather operate together, or to lack of information about what is actually going on over large areas of the globe. The IBM electronic computer at Suitland, Md. holds out hope of improvement though methods are not now advanced enough to give much success. Pressure jump theory (TEPPER) promises to aid in warning of tornadoes and severe storms, but not hurricanes. *Subject Headings: 1. Forecast errors 2. Forecast improvement.*—*M.R.*

8F-41

551.509.312

Estoque, Mariano A., *Graphical prediction model with orographic influences*. (In: Chicago. Univ. Dept. of Meteorology, Contract AF 19(604)-1293, Final Report, Feb. 1957. Sec. L. 10 p.

figs., 2 tables, 6 refs., 12 eqs.) Also issued under same contract as Scientific Report, No. 13, Aug. 1956. **DWB**—An example of graphical 1000 mb 24-hour prognosis based on 1) ignoring the orographic effect of the Rocky Mountains, 2) including the simplified model for orography, and 3) numerical forecasts of 900 mb level D-values using Charney-Phillips 3-level model. These 3 prognostic charts (for U. S.) are compared with actual chart. The situation was one where orographic influences were known to be strong, and the results, using the orographic factor, were much better than those without. The same amount of improvement may not occur where orographic influences are weaker. The prediction equations are worked out in theory to take account of vertical velocities induced by orography. *Subject Headings: 1. Graphical forecasting models 2. Orographic influences.*—M.R.

8F-42

551.509.312:551.511

Farkas, Edith, *Relation of the surface pressure tendency to the vorticity advection at the 300 mb level.* New Zealand. *Meteorological Service, Technical Note*, No. 109, March 25, 1954. 2 p. 4 refs. **DWB**—Theoretical investigations by CHARNEY (1941), SUTCLIFFE (1947), and ALAKA et al. (1953), suggest that the surface pressure falls where the relative vorticity in the upper troposphere decreases downstream and conversely. To test this suggestion, the signs of the vorticity advection at 300 mb and the corresponding surface pressure tendencies were compared for a summer and a winter month in the Wellington, New Zealand area. The results of this test do not support the relationship suggested above. *Subject Headings: 1. Pressure tendency forecasting 2. Vorticity advection 3. Objective forecasting.—Author's abstract.*

8F-43

551.509.312

Fawcett, Edwin B.; Hubert, William E. and Stickles, Albert L., II, *Organization and operation of the Joint Numerical Weather Prediction Unit.* *Weatherwise*, Boston, 9(3):75-79, June 1956. 5 figs., 3 photos. **DWB**—Details of the beginning, the development, the organization and operation of the Joint Numerical Weather Prediction Unit at Suitland, Md., are outlined and illustrated. The project began July 1, 1954 with 15 meteorologists. The IBM 701 electronic computer was delivered in March 1955, and experimental forecasts were issued in April 1955. Two models are used: a 3 level (1000, 700 and 500 mb) model for North America for 12, 24 and 36 hr forecasts, and a 500 mb model for 24, 48 and 72 hour Northern Hemisphere forecasts. Examples of machine analyses and forecasts are compared with observed for Feb. 5-6, 1956. Vertical motion and precipitation charts are also shown. *Subject Headings: 1. U. S. Joint Numerical Weather Prediction Unit 2. Numerical forecasting.—M.R.*

8F-44

551.509.312:551.511

Fjørtoft, Ragnar, *Graphical integration of the barotropic vorticity equation.* *Norske Videnskaps-Akademi i Oslo. Institutt for Vær- og Klimaforskning, Report*, No. 6, 1952. 4 p. 3 figs., 18 eqs. **DWB**—By advecting the vorticity field with a spatially-averaged wind field, a 24-hr forecast may be obtained in one time step. Since this whole method is done graphically a forecast may be completed in approximately 3 hrs by one person. Results look encouraging although no statistics are available yet. (*Revision of item 5F 61, June 1954, MAB.*) *Subject Headings: 1. Integration techniques 2. Fjørtoft's graphical method 3. Vorticity equations.—Tellus.*

8F-45

551.509.312

Fjørtoft, Ragnar (*Univ. of Copenhagen*), *On the use of space-smoothing in physical weather forecasting.* *Tellus*, Stockholm, 7(4):462-480, Nov. 1955. 4 figs., 6 refs., 115 eqs. **DWB, DLC**—Extends the treatment of the author (*see 4.10-71, Oct. 1953, MAB*) on space smoothing of horizontal stream field in the barotropic model to an improved technique considering "unsmoothing" as a method of obtaining a spectral analysis of horizontal scalar fields and to remove systematic errors due to using finite differences as derivatives. A general theorem for trajectory or displacement of barotropic flow and applications of smoothing to this problem is followed by consideration of the baroclinic case (vertical velocity, and deformation effect on interchange of potential and kinetic energy). In the following sections, the importance of nonlinear interference for creation and geographical distribution of disturbances, the integration problem and a simple nonadvective model are treated. The trajectory problem for levels other than the vertically mean level is discussed. (*Same item as 7.11-140, Nov. 1956, MAB.*) *Subject Headings: 1. Space-smoothing techniques 2. Numerical forecasting.—M.R.*

8F-46

551.509.312

*Flohn, Hermann; Hinkelmann, Karl; Hollmann, Günther; Schwarzenberger, R. and Wippermann, Friedrich, *Research on objective weather forecasting.* Germany. Deutscher Wetterdienst, Contract AF 61(514)-434, Final Report, foreword, Aug. 1954. Each part repaged. figs., bibliogs., eqs. Contents: Pt. A, *Characteristic processes in numerical forecasting.* 59 p. 23 figs., numerous

eqs. Pt. B, Some numerical tendency computations from a multiple parametric model. 17 p. 51 figs., 2 refs. Pt. C, On the relation between the fields of wind and pressure and their dependence on geographic latitude. 8 p. 4 figs., eqs. Pt. D, On the influence of disturbances on a non-homogeneous basic current. 20 p. 7 figs., 28 eqs., 6 refs. Pt. E, On the behaviour of truncation errors in solution of the two dimensional and non divergent vorticity equation. 10 p. 3 tables, fig., 6 refs., eqs. DWB—A report of work done by working group under HINKELMANN from July 15, 1953 to July 15, 1954 on numerical prediction problems as indicated by parts listed above. In Pt. A, the theory of "characteristic processes," with 2 independent and with 3 or 4 independent variables, is elaborated. Application to meteorological problems is made, using hydrostatic and geostrophic wind equations, neglecting vertical and total acceleration, respectively, using quasigeostrophic approximation and, finally, involving the baroclinic case. In Pt. B the basic equations and the finite difference equations are set up, using a discontinuous model. Then the linear transformation of variables ϕ_t and ϕ (dynamic height), numerical solution of system, cages and their removal by block relaxation, and actual results of numerical weather predictions (225, 300, 500, 700, and 850 mb tendencies) for a number of periods. In Pt. C the influence of latitude, coriolis effect on wind and pressure field were tested using nongeostrophic assumptions. In Pt. D the tendencies of the basic current and its kinetic energy are shown graphically for different parameters. Finally, discontinuities of the basic current are superimposed by means of perturbations. (For Pt. E see 3F-149.) (Same item as 6.11-143, Nov. 1955, MAB.) Subject Headings: 1. Numerical forecasting 2. Europe.—M.R.

8F-47

551.509.312

Frenkiel, François N. (Applied Physics Lab., Johns Hopkins Univ.), Possibilities and significance of high-speed computing in meteorology. Washington Academy of Sciences, Wash., D. C., Journal, 16(2):33-37, Feb. 1956. DLC—Also in: I.U.G.G. Association of Meteorology, Rome, Sept. 1954, Scientific Proceedings. London, Butterworth, 1956. p. 469-475. DWB—The author discusses the use of high speed computing in numerical weather forecasting, in the statistical analysis of atmospheric motions in particular turbulent energy transfer, in the study of the planetary circulation, in atmospheric pollution problems, and in the development and trajectories of tropical cyclones. Subject Headings: 1. Numerical forecasting 2. Atmospheric motion 3. Statistical analysis.—I.L.D.

8F-48

551.509.54:551.509.312

Fujiwara, S., The precipitation under the assumption of dry adiabatic change and moist adiabatic change of the air. Meteorological Society of Japan, Tokyo, Journal, Ser. 2, 34(5):271-275, Oct. 1956. 2 figs., table, 7 refs., numerous eqs. DWB, DLC—In connection with the quantitative prediction of precipitation using numerical methods, equations are developed for calculating water vapor condensation and vertical velocity considering both dry and moist adiabatic change. (Same item as 8E-11, May 1957, MAB.) Subject Heading: 1. Numerical precipitation forecasting.—G.T.

8F-49

551.509.312:517.512.2

Gambo, K.; Katow, K.; Manabe, S. and Aihara, M. (all, Geophysical Inst., Tokyo Univ.), Numerical forecasting over the Far East by the double Fourier series method. Meteorological Society of Japan, Journal, Ser. 2, 33(3):133-139, July 1955. 6 figs., 2 tables, 5 refs., 29 eqs. DWB, DLC—The results of numerical forecasting over the Far East are presented. In this paper, we use the double Fourier series in order to calculate the Jacobian of vorticity ζ and the height of isobaric surface Z and also to solve the Poisson equation. We also show that the results of numerical forecasting will be improved if we take a shorter time interval between each step. In connection with this problem, the outline of the relay-computer (FACOM-100) which is available is described briefly. (Same item as 7.10-100, Oct. 1956, MAB.) Subject Headings: 1. Numerical forecasting 2. Fourier series 3. Far East.—Authors' abstract.

8F-50

551.509.312

Gambo, K.; Saito, S.; Fujiwara, S. and Murakami, T., Topographical effects upon the numerical weather prediction in the lower atmosphere. Journal of Meteorological Research, Tokyo, 8(8):473-494, Oct. 1956. 23 figs., 2 tables, 9 refs., 82 eqs. In Japanese; English summary p. 473. Also in: Meteorological Society of Japan, Tokyo, Journal, Ser. 2, 34(5):254-265, Oct. 1956. 13 figs., 10 refs., numerous eqs. DWB, DLC—Height changes of constant pressure in the lower atmosphere are analyzed. Two factors contribute to the vorticity change with time: horizontal advection of absolute vorticity and divergence or convergence of horizontal velocity. The former is obtained by calculation of the so-called Jacobian; there are many ways of estimating the latter. The authors propose a method for precise calculation of divergence or convergence of horizontal velocity, accounting for the effect of topography. Vertical velocities thus obtained are compared with good agreement with amounts of precipitation due to orographic effects. Subject Headings: 1. Numerical forecasting 2. Topographic effects.—Authors' abstract.

8F-51

551.509.95:551.543

Gandin, L. S. and Sinel'nikova, K. K., *O prognoze skorosti peremeshchenia baricheskikh tsentrov*. [Forecasting the velocity of displacement of baric centers.] *Meteorologiya i Gidrologiya* Moscow, No. 3:27-30, May/June 1955. table, 2 refs., eqs. **DWB**—The authors develop a quantitative method for forecasting the movement of pressure centers based upon the transformation of known extrapolation formulas and the results of verification of the prepared method and of other methods on the basis of extensive material. The formulas developed are:

$$v_c = \frac{B^2}{P_c - P_1} \cdot \frac{\partial P_1}{\partial y} \quad \text{and} \quad v_c = - \frac{B^2}{P_2 - P_c} \cdot \frac{\partial P_2}{\partial y}.$$

The procedure for calculating the movement of pressure centers and that of verification are outlined and the forecasting is compared with the method of V. I. BUSHUK. (Same item as 7.9-117, Sept. 1956, *MAB*.) *Subject Headings*: 1. Pressure tendency forecasting 2. Extrapolation formulas.—I.L.D.

8F-52

551.509.312

§Gates, W. Lawrence; Pocinki, Leon S. and Jenkins, Carl F., *Results of numerical prediction with the barotropic and thermotropic atmospheric models*. *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 46, Aug. 1955. 107 p. figs., tables, 17 refs., 26 eqs., numerous charts. **DLC**—Following a résumé of the theory of thermotropic flow, a simple baroclinic model in which the direction of the thermal wind is assumed invariant with height, a discussion of the methods employed for the numerical integration of this model and the barotropic model are presented. On a finite-difference grid of 414 points covering the United States and immediately surrounding regions, a series of sixty comparative 24 hr forecasts during Jan. 1953, at the 500 and 1000 mb levels was obtained by relaxation methods. The median correlation coefficients between the forecast and observed 24-hr height changes were 0.80 for both thermotropic and barotropic models at 500 mb and 0.69 for the thermotropic model at 1000 mb. In comparison with a method of pure interpolation, the numerical forecasts are shown to display a positive "skill" toward the center of the forecast region where the influence of the lateral boundaries is smallest. By normalizing the root-mean-square forecast errors to allow for the normal latitudinal variation, the Rocky Mts. are found to exert a marked influence on the forecasts at both 500 and 1000 mbs over the south central United States. From a synoptic point of view, the numerical forecasts are found to compare favorably with conventional forecasts for the same period, although they appear to introduce a small but systematic tendency to move fully developed disturbances too slowly. This error is felt to stem from the truncation errors of the finite-difference schemes employed. Recommendations for further research to reduce the several sources of error and to extend the physical basis of the model are made. *Subject Headings*: 1. Numerical forecasting 2. Relaxation methods 3. Barotropic models 4. Thermotropic models.—Authors' abstract.

8F-53

551.509.31

Gilchrist, B. (*Inst. for Advanced Study, Princeton*) and Cressman, G. P. (*U. S. Air Weather Service*), *An experiment in objective analysis*. *Tellus*, 6(4):309-318, Nov. 1954. 4 figs., 4 tables 3 refs. **DLC**—An experiment in two-dimensional objective analysis, conducted at The Institute for Advanced Study is described. The method consists of fitting a second degree polynomial by the method of least squares to the meteorological data in a limited area around each point in a rectangular grid, and then interpolating for the height of the pressure surface at the grid point. The results of machine computations give analyses which are comparable in quality to the subjective analysis ordinarily encountered. When used in a three-parameter atmospheric model for a numerical forecast, the objective analyses led to a more accurate forecast than carefully prepared subjective analyses did. Also a satisfactory representation of the field of vertical stability (over North America) was obtained by the two-dimensional analyses, made for three different pressure surfaces. The greatest obstacle encountered in producing a completely objective analysis arises from errors of computation and transmission of raw meteorological data. This obstacle has not been overcome, and necessitates a preliminary objective examination of the data for detection of errors. (Same item as 6.9-118, Sept. 1955, *MAB*.) *Subject Headings*: 1. Objective weather map analysis 2. Synoptic analysis 3. Numerical forecasting.—Author's abstract.

8F-54

551.509.312

Gocev, N. G., *Chisleno predskazvane na vremeto s pomoshhta na barotropniia model*. [Numerical weather forecasting with the barotropic model.] *Khidrologiya i Meteorologiya*, Sofia, No. 1:24-30, 1957. 5 refs., 13 eqs. Russian and English summaries p. 29-30.—A review of the principles of numerical forecasting with the barotropic model of CHARNEY (following RICHARDSON's pioneer work) and citing texts of BELINSKIĭ (1948, Ch. XX) and GANDIN et al. (1955, Ch. X) for

dynamic theory. The success of such forecasts using the "Maniac" in Princeton, "BESK" in Stockholm, the α EO in London and, in the near future, the "Strela" in Moscow are mentioned. *Subject Headings: 1. Numerical forecasting 2. Barotropic models.—M.R.*

8F-55

551.509.312

Hašek, Milan and Šidák, Zbyněk, **K problému verifikace předpovědí vyjádřených čísly.** [Verification of numerical forecasts.] *Meteorologické Zprávy*, Prague, 9(5 6):141-144, 1956. figs., table, 5 refs., 12 eqs. Russian, English and German summaries p. 141. **DWB**—Methods of verification of forecasts of meteorological elements expressed in numbers in a time series are described as well as those of the pressure field. Both problems lead to the same mathematical formulation, but their differences are respected whenever meteorological considerations make it necessary. Known methods of verification are reviewed, a critique of verification by means of the correlation coefficient is given and possibilities of its correct application are shown. New verification methods and use of weighting in the verification of the pressure field are proposed. However, this involved problem of weighting is not treated exhaustively and it is hoped that further contributions on this subject will be forthcoming from meteorologists. *Subject Headings: 1. Numerical forecasting 2. Forecast verification.—Authors' abstract.*

8F-56

551.509.312:681.14

Henry, T. J. G. (Met. Branch, Toronto), **Numerical forecasting on FERUT.** *Royal Meteorological Society, Canadian Branch*, [Publications], 7(2):13-19, Oct. 18, 1956. figs., eqs. **DWB**—The experimental work in numerical forecasting with a one parameter (500 mb flow) model, using the Ferranti Mark I electronic computer (FERUT) at the Univ. of Toronto, is described and a few of the test maps illustrated (0300 Z, March 13 and 14, 1955). The first run used steps of one hour, the second 1½ hours, with 3 iterations involved in solving the Poisson equation. The 3rd run used 5 iterations and in the 4th run the grid boundaries were held constant during the forecast period. Machine time for run No. 1 was 43 min. Limitations and future work (using a 2 parameter thermotropic model similar to the JNWP model), graphical techniques, and work done in Stockholm are touched on. The one parameter model gave good results in Eastern Canada and poor results in the West and Plateau. *Subject Headings: 1. Numerical forecasting 2. Thermotropic models.—M.R.*

8F-57

551.509.312:518

Hinkelmann, Karl and Schwarzenberger, Rudolf, **Charakteristikenverfahren in der numerischen Wettervorhersage.** [Method of characteristics in numerical forecasting.] *Germany. Deutscher Wetterdienst, Berichte*, 2(14), 1954. 26 p. 24 figs., 17 refs., eqs. **DWB**—Modern methods for the numerical solution of a system of partial differential equations are discussed and further developed for the needs of numerical weather forecasting. It was necessary to analyze problems in higher dimensions than was done before for hydrodynamic applications. The characteristic initial value problems are developed. The advantage of the new method is that the solutions can be computed more conveniently and with better control of errors in numerical integration. It is shown how to simplify the basic three equations of motion, the equation of continuity and the first thermodynamic theories in order to get workable systems of differential equations. This is done partly by sacrificing important aspects. The whole treatment is highly theoretical, no practical examples are shown as yet. (Same item as 7.3-127, March, 1956, MAB.) *Subject Headings: 1. Numerical forecasting 2. Hydrodynamics 3. Mathematical techniques.—A.A.*

8F-58

551.509.312

Hollmann, G., **Eine neue Methode zur approximativen Lösung barokliner Prognoseprobleme.** [A new method of approximate solution of baroclinic forecasting problems.] *Meteorologische Rundschau*, 8(3/4):42-44, March/April 1955. 28 eqs. Also English version as: **A new method of solving the primitive prognostic equations.** *Germany. Deutscher Wetterdienst, Contract AF 61(514)-735-C*, Technical Note No. 4, 1956? 10 p. ref., 29 eqs. **DWB**—A new method of solving the prognostic equations for a baroclinic atmosphere is discussed. This procedure uses the primitive hydro- and thermodynamic equations and as a filter for noise effects the condition that the divergence of horizontal motion, averaged over a whole air column from the top to the bottom of the atmosphere, has to vanish. With only this model assumption the integration of the vorticity equation, the divergence equation and the adiabatic equation required only quadratures and solutions of two-dimensional Poisson equations. The used filter condition, however, is not sufficient to eliminate internal gravity waves, if the lapse rate is nonadiabatic. It is suggested, that by a modification of the adiabatic equation corresponding to introduction of fictitious heat sources also these internal gravity waves can be excluded. (Same item as 6.10-99, Oct. 1955, MAB.) *Subject Headings: 1. Numerical forecasting 2. Baroclinic models.—Author's abstract.*

8F-59

551.509.312

Hollmann, G., *Über die Behandlung barokliner Prognoseprobleme mit Hilfe nichtgeostrophischer Gleichungen.* [On the treatment of baroclinic forecasting problems with the help of non-geostrophic equations.] *Meteorologische Rundschau*, 8(5 6):73-78, May/June 1955. fig., 5 refs. 71 eqs. **DWB**—Simple fields are solved by linearized equations comparing geostrophic and non-geostrophic integration methods. As the general equations of motion, besides synoptic processes, include irrelevant phenomena in their solution, the vanishing of the divergence of horizontal flow means over the vertical is used as a condition for the elimination of *external* gravity waves. This condition applies however only in an indifferently stratified atmosphere (advection model) for filtering out all irrelevant processes. Especially for short waves in a baroclinic atmosphere there are considerable differences between geostrophic and non-geostrophic calculated fields. To eliminate the *internal* gravity waves in a hydrostatic stably stratified atmosphere a slight modification of the thermodynamic equation is introduced, while the equations of motion retain their original form. The resulting method of step integration of the non-linear equations is described. (*Same item as* 7.2-102, Feb. 1956, *MAB.*) *Subject Headings:* 1. Numerical forecasting 2. Nongeostrophic equations 3. Baroclinic models.—*Trans. of author's abstract.*

8F-60

551.55:551.542.1:551.509.312

Hollmann, G., *Über prinzipielle Mängel der geostrophischen Approximation und die Einführung ageostrophischer Windkomponenten.* [The basic deficiencies of the geostrophic approximation and the introduction of ageostrophic wind components.] *Meteorologische Rundschau* Berlin, 9(5/6):73-78, May/June 1956. 11 refs., 59 eqs. **DLC**—This mathematical paper examines some of the fundamentals of numerical forecasting. If too many approximations are made in the geostrophic and vorticity terms, considerable errors of geopotential tendency may be introduced. Questions of hydrostatic stability and vertical motion during a change of enthalpy are considered. "It follows that in order not to obtain a result in conflict with the energy principle, the application of the geostrophic approximation must ignore horizontal differences of hydrostatic stability." Finally, attempts to build non-geostrophic theories with only a partial regard for ageostrophic wind components are critically considered. (*Same item as* 7.10-198, Oct. 1956, *MAB.*) *Subject Headings:* 1. Geostrophic approximation 2. Numerical forecasting.—*C.E.P.B.*

8F-61

551.509.52:551.509.312:551.515.2

Hubert, Lester F. (U. S. W. B., Wash., D. C.), *Numerical weather prediction of hurricane motion.* U. S. Weather Bureau National Hurricane Research Project, Report, No. 2, July 1956. 29 p. 29 figs., 2 tables, foot-refs. Pre-printed report. **DWB**—Although the barotropic method used in preparing the Joint Numerical Weather Prediction Unit's 500 mb prognostic maps was not specifically designed for indicating hurricane motion, such indications will be given whenever a hurricane Low appears on the initial map. The purpose of this paper is to instruct forecasters on the methods used in preparing 24, 48 and 72 hr forecasts of hurricane position, and thereby to enable them to make proper use of such forecasts in conjunction with forecasts obtained by other methods. Results of fourteen numerical forecasts made on seven hurricanes are reported, predicted trajectories graphically compared with actual ones, and sources of error discussed. (*Same item as* 7J-187, *MAB.*) (For Supplement, see 8F-153.) *Subject Headings:* 1. Numerical hurricane forecasting 2. Hurricane movement forecasting.—*G.T.*

8F-62

551.509.312

Institute for Advanced Study, Princeton, N. J., *Report of the director, 1948/1953.* pub. 1954. 41 p. **DWB**—Along with reports of other activities in the History and Mathematics Faculties, the work and personnel of the Electronic Computer Project organized in 1946 by JOHN VON NEUMANN is described in a vivid style, with particular attention to the Meteorology Project (numerical weather prediction) established under the Computer Project in 1946 by JULES CHARNEY, first using the Eniac Computer at Aberdeen Proving Ground, and after Jan. 1952 the Institute's computer, ultimately leading to "correct calculation of the great Appalachian storm of Nov. 25, 1950" and similar success for Nov. 12, 1952 and Nov. 5, 1953 storms, proving "that numerical methods are more accurate than all existing standard methods." (*Same item as* 6.6-106, June 1955, *MAB.*) *Subject Headings:* 1. Institute for Advanced Study, Princeton, N. J. 2. Numerical forecasting 3. Electronic computers. I. Oppenheimer, Robert.—*M.R.*

8F-63

551.509.312:631.14:621.38

§Institute for Advanced Study, Princeton, N. J., *Electronic Computer Project.* Contract DA-36-034-ORD-1023, Final Report, April 1954. Pt. 1, 60 p. 15 figs., 6 tables. Pt. 2, 137 p. figs., tables, 6 refs., numerous eqs. **DWB**—A voluminous report covering: 1) Engineering work on numerical integration and input and output testing equipment, and on maintenance. 2) Mathematics (total differential equations), flows past curved obstacles, eigenvalues of symmetric matrices,

herical blast wave, random numbers, solid diffusion in fixed beds and other problems stemming from Richardson's work. 3) Meteorological problems of the barotropic 2-level and baroclinic or level models. Tests were made on the Nov. 23 to 26, 1950 storm which affected the Princeton-New York area. The 6, 12, 18 and 24-hour forecast height deviation charts for Nov. 24 and 25, 1950 are given along with the actual Nov. 25, 1950, 900 mb chart, showing that strong winds and developments were fairly accurately predicted by these methods. (Same item as 8.1 162, Jan. 1957, MAB.) *Subject Headings:* 1. Numerical forecasting 2. Electronic computers.—M.R.

8F-64

551.509.312

§Institute for Advanced Study, Princeton, N. J., **The electronic computer project.** Contract A-36-034-ORD-1330, Final report Dec. 1954. 58+68+42 p. numerous figs., and eqs. DWB—he report covers engineering, programming and forecasting work performed under several contracts during 1953-54, by J. VON NEUMANN, B. GILCHRIST, J. CHARNEY and a number of other workers at the Institute for Advanced Study. Wiring, construction, adjustment, scheduling, theoretical and actual numerical forecasting operations are described in detail and illustrated. Actual examples of prognostic and observed synoptic charts are presented. A series of 20 (200 and 500 mb) barotropic recasts was made for low latitudes for H. RIEHL. Tests of 3-level models, vertical velocity calculations, objective analysis tests and studies of wind driven waves in the sea are reported in Pt. III (Meteorology). A number of mathematical tests (blast waves, solar hydromagnetodynamics, etc.) are reported in Pt. II. *Subject Headings:* 1. Numerical forecasting 2. Electronic computers. I. von Neumann, J.—M.R.

8F-65

551.509.312:551.515.11

Japan. **Japan. Numerical Prediction Group, Tokyo, Preliminary report on the numerical prediction over the Far East.** *Geophysical Magazine*, Tokyo, 26(1):35-51, Aug. 1954. 7 figs., table, 4 refs., 35 p. Summary in: *I.U.G.G. Association of Meteorology, Rome, Sept. 1956, Scientific Proceedings*, pub. London, Butterworth, 1956. p. 504. DWB—The usefulness of barotropic models in forecasting 500 mb height changes in the Far East was investigated by applying Fjortoft's graphical method and Bolin-Charney's relaxation method to aerological data of Japan and surrounding areas for Jan. 9-15, 1953. Computed and observed values are compared. Preliminary results and errors are discussed and objectives of future research outlined. (Same item as 6.11-144, Nov. 1955, IAB.) *Subject Headings:* 1. Numerical forecasting 2. Barotropic models 3. Relaxation methods 4. Height tendency computation.—G.T.

8F-66

551.509.312:551.515.2(213)

Jordan, Charles L., **An experiment in low-altitude numerical prediction with the barotropic model.** *Journal of Meteorology*, 13(3):223-235, June 1956. 17 figs., 4 tables, 16 refs. Also as: Chicago Univ. Dept. of Meteorology, Contract N6ori-02036, Sept. 1955. 29+ p. 40 figs., 4 tables, 25 refs., eqs. DWB—Three series of numerical predictions were run for a low latitude ridge (Western Atlantic and Caribbean area): Aug. 25-29, Sept. 23-27 and March 29-April 2, 1953. The results (difference between observed and forecast 24-hour 500 mb height change) are tabulated, correlation coefficients calculated and charts or graphs of several types (500 mb, 200 mb, absolute vorticity, tephigrams, wind profiles, hurricane ["Florence"] tracks, cloudiness, etc.) presented and discussed. It is concluded that numerical predictions can be extended to low latitudes in spite of the severe analysis problem (lack of dense or accurate enough networks) if broad general motions are involved. More detailed numerical analysis will be possible with rawinsonde stations now being installed in area. Most features of hurricane "Florence" were smoothed out in the process—only the steering direction and speed would have been of any value in prediction. (For fuller abstracts, see 10-102 and 8.3-123, Oct. 1956 and March 1957, MAB.) *Subject Headings:* 1. Numerical hurricane forecasting 2. Tropical weather forecasting.—M.R.

8F-67

551.521.61:551.509.312

Kaplan, Lewis D. (*Inst. for Advanced Study*), **Problems involved in introducing long-wave radiative effects into mathematical models.** Institute for Advanced Study, Princeton, Contract N-ONR-1358(01), Technical Report, 1955. 7 p. 6 refs., 2 eqs. DWB—Working on the problem of using electronic calculators for determining the radiative balance of the atmosphere as a whole, and temperature changes in specified layers, the author enumerates the most vexing aspects and predicts that a model sufficient for the calculation of flux in vertical columns will be available in a few months and one for the vertical distribution of radiative temperature changes in about two years—not sooner. Greatest accuracy in details of radiative processes is useless until a circulation scheme which can predict cloudiness is available, since most of the radiative loss is from the top of cloud layers, whose amount and height are not too well known. The principal error in past models arises from ignoring temperature dependence of water and CO₂ spectra, and from not knowing the

total band intensity of CO_2 . This has been found to be 30%-40% higher than previous estimates. *Subject Headings: 1. Numerical computation of radiative balance 2. Radiative transfer.—M.R.*

8F-68

551.509.312:551.511

§Kerr, I. S., *Some examples of 500 mb prognoses by Fjörtoft's graphical method.* *New Zealand Meteorological Service, Technical Note*, No. 112, 1954. 8 p. figs., 2 tables, refs., 8 eqs. **DWB**—The graphical method of integration of the barotropic vorticity equation due to FJÖRTOFT (1952) has been applied on ten occasions. The results are illustrated and discussed. Although the 500 m prognostic maps produced by the method were superior, probably in significant degree, to those obtained by the usual extrapolation methods, it is doubtful if the superiority is sufficiently great to justify the time and labor involved in routine application of the method. (*Same item as 6.5-70*, May, 1955, *MAB.*) *Subject Headings: 1. Numerical forecasting 2. Vorticity equations 3. Fjörtoft's graphical method.—Author's abstract.*

8F-69

551.509.312:551.55:551.542.1

Kibel', I. A., *O prispособlenii dvizheniia vozdukh k geostroficheskomu.* [Adaptation of air movement to the geostrophic.] *Akademiia Nauk SSSR, Doklady*, 104(1):60-63, 1955. 2 refs., 26 eqs. **DLC**—The differential equations of continuity used in short range forecasting are linearized and the adaptation of air movement to the geostrophic is demonstrated. *Subject Headings: 1. Numerical forecasting 2. Geostrophic approximation.—I.L.D.*

8F-70

551.509.312

Knighting, E., *An atmospheric model for numerical integration including the tropopause effects.* *Great Britain. Meteorological Research Committee, M.R.P.*, 1002, Sept. 17, 1956. 5 p. fig., 2 refs., 13 eqs. Also his: *A non-geostrophic extension of the Sawyer-Bushby model of the atmosphere suitable for numerical integration.* *Ibid.*, 1003, Sept. 17, 1956. 4 p. 2 refs., 20 eqs. **Mimeo.** **DWB**—In the first paper a simple model is developed which includes a variable pressure surface corresponding with the tropopause. Prognostic equations include one for tropopause pressure. In the second paper a two-level model is used in which divergence is not zero at the surface but is zero at 500 mb. Vertical velocity becomes the key to development. Prognostic equations are set out and stream and potential functions introduced. The equations are difficult to solve and some simplifications are suggested. (For fuller abstracts, see 8.4-131 and 8.4-132, April 1957, *MAB.*) *Subject Headings: 1. Numerical forecasting 2. Tropopause pressure 3. Nongeostrophic wind effects 4. Sawyer-Bushby model.—C.E.P.B.*

8F-71

551.509.312

Kubota, S. (*Met. Res. Inst., Tokyo*), *Numerical prediction by the quasi-double Fourier series.* *Papers in Meteorology and Geophysics*, Tokyo, 5(2):144-152, Sept. 1954. 7 figs., 5 refs. **DWB**—The purpose of the present paper is to examine the possibility of numerical prediction by Fourier series and to analyze the atmospheric structure. Multiplying the vorticity equation by a periodic function and integrating it from 0 to 2π (along a latitude circle), certain equations can be obtained. The following results can be derived from numerical calculation on the barotropic model, i.e., 1) Numerical prediction is possible by the Fourier series with the harmonics from $n=1$ to $n=9$. 2) Correlation between the zonal flow of component-wave vorticity by the mean flow and the meridional flow of absolute mean flow vorticity by that component wave is negative at middle latitudes from 55°N to 40°N , and positive at 60°N . 3) The same relation as in 2) can be found in the interaction between the component waves. 4) The nonlinear effect at lower latitudes than 55°N is reverse to that at 60°N , which, coupled with that shown in 2) and 3), tells us that 55°N lat. circle, roughly speaking, forms a kind of nodal line. 5) Magnitude of time change of amplitudes of long waves cannot be explained by the barotropic and nondivergent model, perhaps due to the upward motion and horizontal stability changes caused by the topography. (*Same item as 6.11 145*, Nov. 1955, *MAB.*) *Subject Headings: 1. Numerical forecasting 2. Fourier series 3. Barotropic models.—Author's abstract.*

8F-72

551.509.33:551.511:551.513.1

Kubota, S. (*Met. Res. Inst., Tokyo*) and Kurihara, Y. (*Central Met. Obs., Tokyo*), *A study of the extended forecasting with the barotropic model.* *Meteorological Society of Japan, Journal*, Ser. 2, 34(3):147-157, June 1956. 3 figs., 2 tables, 10 refs., 15 eqs. **DWB, DLC**—In order to obtain the materials appropriate for the study of extended forecasting, we calculated the six-day change of the height of 500-mb isobaric surface by the barotropic model, where the height z is expressed by one-dimensional Fourier coefficients along each latitude circle. *Subject Headings: 1. Extended forecasting 2. Barotropic models 3. Numerical forecasting.—Authors' abstract.*

8F-73

551.509.312:551.513.1

Kuo, H.-L. (*M.I.T.*), On quasi-nondivergent prognostic equations and their integration. *Tellus*, Stockholm, 8(3):373-383, Aug. 1956. 4 figs., 9 refs., 31 eqs. **DLC**—Also issued as Massachusetts Institute of Technology. Dept. of Meteorology, Contract AF 19(604)-1000, Scientific Report, No. 2, Aug. 31, 1955. 37 p. 4 figs., 15 refs., 41 eqs.—A general two-dimensional wind-pressure relationship is obtained as the first integral of the so-called "balance equation" which requires the horizontal divergence to remain small as compared with the vertical component of the relative vorticity for the large-scale motions. This wind-pressure relationship is used in determining the initial conditions and in deriving the governing equations. The use of this general system removes the error introduced by the quasi-geostrophic approximation. An influence function is computed for a normal atmosphere. This function represents the reaction of the atmosphere to a point source perturbation and may be used to integrate the three-dimensional governing equation for arbitrary initial disturbances. A set of such functions may be computed, corresponding to different values of the parameter $f^2 \cos^2 \phi / T$, to meet different situations. *Subject Headings: 1. Numerical forecasting 2. Perturbation equations 3. Baroclinic models.*—*Author's abstract.*

8F-74

551.509.312:517.512.2

Kurihara, Y. (*Central Met. Ob., Tokyo*), Regional numerical weather prediction in a barotropic atmosphere by the method of one-dimensional Fourier series with one-dimensional relaxation. *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 33(4):145-152, Sept. 1955. 4 figs., 2 tables, 10 refs., 20 eqs. **DWB, DLC**—The height change of 500 mb isobaric surface in a barotropic atmosphere is calculated by making use of the coefficients of one-dimensional Fourier series along latitude circles with one dimensional relaxation with respect to latitude. In this paper, the tendency equations concerning Fourier coefficients along latitude circles are derived as a function of latitude from a vorticity equation, and their finite difference expressions are given in order to simplify the calculation. The subjects as to the number of component-waves to be considered and the choice of their interactions were the most important. The problem of error in this method was also considered. (*Same item as 8.4-133, April 1957, MAB.*) *Subject Headings: 1. Numerical forecasting techniques 2. Fourier series.*—*Author's abstract.*

8F-75

551.509.312

Liao, Tung-Hsien (*Central Inst. of Met. Res., Central Weather Bureau, China*), Simplified graphical method for numerical prediction with a two-parameter model of the atmosphere. *Scientia Sinica*, Peking, 6(1):191-202, Feb. 1957. 12 figs., 4 refs., 14 eqs. **DLC**. "First published in *Acta Meteorologica Sinica*, Peking, 27(2):153-166, 1956." **GB-MO**—With a two-parameter model a graphical method for predicting the height of 500 mb surface is presented. This method is much in accord with that given by FJØRTOFT for barotropic model. For a case of intense development of cold air outbreak three 500 mb prognostic charts were computed for 24-hr intervals. It is found that the locations and intensities of the systems computed by this method are in reasonable agreement with the observed ones. *Subject Headings: 1. Numerical forecasting 2. Graphical forecasting models.*—*Author's abstract.*

8F-76

551.509.3:519.24

Malone, Thomas F., (*Travelers Weather Research Center, Hartford, Conn.*), Application of statistical methods in weather prediction. *National Academy of Sciences, Wash., D. C., Proceedings*, 41(11):806-815, Nov. 15, 1955. 4 figs., table, 7 refs., 2 eqs. **DWB**—A field of 91 points distributed over North America is used to express the pressure distribution in operator form. Two successive 24-hr pressure fields give the possibility of computing the expected pressure change in a least square sense. The results are encouraging with frequent correlation coefficients between 0.7 and 0.9. A similar method was applied to temperature and to a weather index, which gives primarily the probability of precipitation. *Subject Headings: 1. Statistical forecasting 2. Numerical forecasting 3. North America.*—*A.A.*

8F-77

551.509.312:551.513.2:551.515

Manabe, S. (*Geophysical Inst., Tokyo Univ.*), On the development and the energetics of the westerly waves. (Model research on the tilt of trough). *Meteorological Society of Japan, Journal*, Ser. 2, 33(2):76-88, March 1955. 8 figs., 7 refs., 7 eqs. **DWB, DLC**—Using 2-layer model which is the special case of the multiple layer model defined by CHARNEY and PHILLIPS, investigation is made, from the view point of numerical weather prediction, on the role of the tilt of trough relative to the vertical for the development of the pressure pattern. At the same time, the mechanism of the transition between the tilted and the nontilted trough is discussed. Finally, corresponding to the above development, the energetics of westerly wave, i.e., the energy exchange between the potential and the kinetic energy is investigated. Here, the simple expression for the change of

these energies is obtained. (Same item as 7.10 103, Oct. 1956, M.A.B.) *Subject Headings:* 1. Numerical forecasting 2. Upper level troughs 3. Waves in the westerlies.—*Author's abstract.*

8F-78

551.509.312

§Mashkovich, S. A., *Prognoz nazemnogo davleniia s pomoshch'iu bystrodeistvuiushchyykh elektronnykh vychislitel'nykh mashin.* [Forecasting surface pressure with the aid of high-speed electronic computers.] *Meteorologiya i Gidrologiya*, No. 1:8-10, Jan. 1957. 11 figs., 6 eqs. Also in *Akademii Nauk SSSR, Doklady*, 112(2):245-248, Jan. 11, 1957. 3 figs., 3 eqs. **DLC**—Movement over a "flat" earth is examined and proceeding from FRIDMAN's equation describing the vertical component of the vortex of velocity in a given air particle there is developed the following integral equation for the variation of the geopotential with time

$$\frac{\partial H}{\partial t} = \int_0^r \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \left\{ \left[H \Delta H + \beta l \frac{\partial H}{\partial x} \right] M_1(x, y, \zeta, x', y', \zeta') + \left(H, \frac{\partial H}{\partial \zeta} \right) M_2(x, y, \zeta, x', y', \zeta') \right\} dx' dy' d\zeta'.$$

The programming of the BESM computer of the Academy of Science of U.S.S.R. to solve this equation and the results of its use in forecasting are illustrated. Charts of the forecasts obtained are presented. *Subject Heading:* 1. Numerical forecasting.—*I.L.D.*

8F-79

551.509.312

Matsumoto, S., *On the vertical structure of disturbances in a baroclinic atmosphere.* *Papers in Meteorology and Geophysics*, Tokyo, 7(3):179-210, Oct. 1956. 28 figs., 23 refs., 46 eqs. **DWB**—General characteristics of the vertical structure of atmospheric disturbances over Japan are discussed on the basis of aerological data for four winter months. The behavior of a deep stable layer is analyzed from a dynamic point of view. Particular emphasis is placed upon the role of divergence and vertical transport of static stability. An atmospheric model capable of expressing the finer structure of disturbances is designed for purposes of numerical prediction. *Subject Headings:* 1. Numerical forecasting 2. Baroclinic models 3. Japan.—*From author's abstract.*

8F-80

551.511.1:551.509.312

Mertsalov, A. N., *Ob opredelenii "vikhrevoi" chasti izmeneniia davleniia po kartam absolutnoi baricheskoi topografi.* [Determination of the "vortical" portion of pressure change by using maps with absolute baric topography.] *Meteorologiya i Gidrologiya*, Leningrad, No. 6:30-31, Nov./Dec. 1955. fig., table, ref., eq. **DWB, DLC**—The author presents a table showing the agreement according to sign of the vortical pressure changes (H_{700} , ΔH_{700}) with actually measured heights at the 700 mb surface over baric centers at the surface of the earth and describes a method for calculating H and ΔH for intersecting points of a baric field at a given level by means of a transparent grid with points 0, 1, 2 . . . 10 spaced at intervals corresponding to 500 km. The grid is placed upon upper air charts in a way that point 0 coincides with a point on the chart for which (H , ΔH) is to be calculated by means of the equations:

$$(H, \Delta H) = \frac{1}{4R^4} (H_4 - H_2) [(H_8 + H_6 + H_5) - (H_7 + H_{10} + H_5)],$$

where H_2 , H_4 , H_6 , etc. are the values of the absolute geopotential of the isobaric at corresponding points and R —distance between the points in 1000 km or $R/2$ is 500 km and $1/4R^4 = 4$. *Subject Headings:* 1. Vorticity computations 2. Pressure change charts.—*I.L.D.*

8F-81

551.509.312:533.16:551.513.1

Mintz, Yale, *An empirical determination of surface drag coefficients for extended-range and long-range numerical weather forecasting and the study of the general circulation.* (Preliminary Report.) California Univ. at L. A. Dept. of Meteorology, Contract AF 19(604)-1286, Scientific Report, No. 3, Jan. 1956. 18 p. 3 figs., table, 13 refs., 16 eqs. **DWB**—It is shown how the time-averaged vorticity budget of the atmosphere can be used to compute the mean surface stress and the surface drag coefficient in its geographical and seasonal distribution. Some preliminary results are given, using data from the U.C.L.A. General Circulation Project. Some suggestions are made on how this information can be used in extended-range and long-range numerical weather prediction experiments and in the study of the dynamics of the general circulation. *Subject Headings:* 1. Numerical long range forecasting 2. Surface friction 3. General circulation theory 4. Long range forecasting.—*Author's abstract.*

8F-82

551.509.312

Mook, Conrad P. and Norquest, Kenneth S., *Numerical forecasts of vertical motion associated with the heavy snowstorm of March 18-19, 1956.* *Monthly Weather Review*, 84(5):189, May 1956.

fig., 3 refs. **DWB, DLC**—A 24-hr prognostic chart routinely prepared by the U. S. Joint Numerical Weather Prediction Unit is presented and discussed. The chart contains a prediction of vertical motion to be expected at the 800 mb level on March 18, when a major snowstorm occurred over the Eastern U. S. It is found that forecasts of vertical motion may provide valuable information for the prediction of storm tracks and of precipitation. *Subject Heading: 1. Numerical vertical motion forecasting.*—G.T.

8F-83

551.509.312:551.509.317

Moreland, Milton Bruce, *Study of the tendency of isallohyptic centers at the 500 mb level.* Thesis (M.Sc.)—United States Naval Post-graduate School, Monterey, Calif., 1952. 17 p. 2 figs., 5 refs. Photostat of typescript. **DWB**—Upper air data for North America for Nov. and Dec. 1950 were analyzed to determine whether any of the parameters at 700 and 500 mb associated with movements of isallohypses could be used in forecasting. Results were generally not significant—only the movement of 700 mb isallohyptic rise centers gave high correlation with 500 mb flow. Fall center movements did not give significant correlation with flow. Methods, material used and results are carefully outlined and discussed. *Subject Headings: 1. Pressure tendency movements 2. Isalobaric analysis 3. Isallohyptic movements 4. Objective forecasting.*—M.R.

8F-84

551.509.312:551.515.2

Murakami, T.; Masuda, Y. and Arakawa, A., *On the distribution of vertical velocity and the numerical prediction of the movement of typhoon.* *Papers in Meteorology and Geophysics*, Tokyo, 7(3):211-250, Oct. 1956. 31 figs., 3 tables, 7 refs., 43 eqs. **DWB**—The author proposes and develops in detail a numerical method especially suited for use in the forecasting of typhoons (modified layer model). In this method the vertical velocity is computed (instead of being eliminated like in the Charney-Phillips layer model) and the baroclinic term in the vorticity equation is computed from the vertical velocity. One of the advantages of this model is that height changes can be separated into those due to baroclinic and those to barotropic effects. Thus baroclinic effects on the displacement of typhoons can be observed. Application of the method is shown on examples of actual typhoon case histories. *Subject Heading: 1. Numerical typhoon forecasting.*—G.T.

8F-85

551.515.23:551.509.312

Namias, Jerome, *Predict hurricane paths?* *Science News Letter*, 66(14):211, Oct. 2, 1954. **DWB, DLC**—JEROME NAMIAS discusses relation of paths of hurricanes such as those of September 1954 to planetary waves in the general circulation and tells how the electronic computers can aid in making forecasts of probable hurricane trajectories well in advance of their occurrence. *Subject Headings: 1. Hurricane trajectory forecasting 2. Electronic computers 3. Numerical hurricane forecasting.*—M.R.

8F-86

551.509.33:681.1

Namias, Jerome (*U. S. W. B., Wash., D. C.*), *On the possibility of long range weather forecasting by high-speed computing methods.* Remarks presented before the National Science Foundation—University of California at Los Angeles Conference on the Significance and the Possibilities of High-Speed Computing in Meteorology and Oceanography, May 13 15, 1955, Los Angeles, Calif. 7 p. 3 figs., 3 refs. Photo-offset. **DWB**—Since time-averaged pressure charts (first introduced by TEISSERENC DE BORT at the end of the 19th Century) often show as much standard deviation from month to month as synoptic charts show from day to day, numerical methods could be explored for doing the basic computations and analysis which go into the 5-day or longer predictions. Several ways in which the experience of the long range forecasters can be placed at the disposal of the numerical prediction technicians are outlined. Quasi-periodic phenomena or rhythms could be detected by machine. Space variations in weather associated with predicted mean patterns could also be calculated on high speed computers. Vorticity components can also be treated numerically though it is not established that they would be completely valid for mean circulation pattern movements. (*Same item as 7.9-113, Sept. 1956, MAB.*) *Subject Heading: 1. Numerical long range forecasting.*—M.R.

8F-87

551.509.5

Namias, Jerome, (*U. S. W. B.*), *The role of synoptic meteorology in the quest for objective weather prediction.* *National Academy of Sciences, Wash., D. C., Proceedings*, 41(11):802-806, Nov. 15, 1955. 3 refs. **DWB**—The synoptic forecaster will not be displaced by newly introduced machine methods, he will be the key person in the further development of objective methods. *Subject Heading: 1. Objective forecasting.*—A.A.

8F-88

551.509.312

Namias, Jerome (*International Inst. of Met., Stockholm*). The success of 72-hour barotropic forecasts in relation to mean flow patterns. *Tellus*, Stockholm, 8(2):206-209, May 1956. 3 figs., 2 refs. **DLC**—Charts showing the geographical distribution of correlations between observed and barotropically computed height changes for period of 24, 48 and 72 hrs in advance show a number of features that seem to be related to the mean monthly mid-tropospheric flow pattern for the period covered by the forecast. These large scale features are of maximum correlation in the eastern Atlantic (marked by strong ridge) and a maximum near the European trough; both are separated by an area of minimum correlation. Various explanations for the pattern correspondence are proposed. It is concluded that apparently the 72-hour barotropic model can predict only phenomena of the scale of great centers of action, but these centers channel the prevailing air mass flow so that deformation fields, favoring or inhibiting cyclone formation and development, are created in certain areas. The timing of the smaller scale systems may be independent of the long waves obtained by averaging in time. *Subject Headings: 1. Barotropic models 2. Numerical forecasting.—I.L.D.*

8F-89

551.509.312:551.509.33

Namias, Jerome, Progress in objectivization and automation of extended forecasting. *New York Academy of Sciences, Transactions, Ser. 2*, 19(6):581-592, April 1957. 8 figs., 5 refs. **DLC**—Experiments in numerical prediction of 5-day and 30-day mean 500 or 700 mb height patterns or anomalies by using the barotropic model are described and illustrated. Verification of these prognostic charts gives hope that the machines will prove of considerable aid in extended and long range forecasting. The statistical extrapolation provides the greatest part of the skill but inclusion of vorticity factors adds to the goodness of the prognoses. Tests were made on the IBM-701 in Suitland and the BESK in Stockholm. *Subject Headings: 1. Numerical long range forecasting 2. Numerical 5-day forecasts.—M.R.*

8F-90

551.509.312

Newton, C. W., Analysis and data problems in relation to numerical prediction. *American Meteorological Society, Bulletin*, 35(7):287-294, Sept. 1954. 5 figs., 12 refs. **MH-BH**—Instantaneous height tendencies computed from different analyses of the same 500 mb chart illustrate that discrepancies in analysis or observations can have a serious effect on the accuracy of numerical forecasts. The present status of the Northern-Hemisphere aerological network is reviewed, stressing the inhomogeneity of the radiosonde network, the need for observations in fringe areas surrounding the present dense networks, and the desirability of more radio-wind stations. The suggestion is made that machine prognoses incorporating variations of fictitious observations could be used to evaluate the improvements needed and the desirability of setting up new aerological stations in particular locations. (*Same item as 6.5-71, May 1955, MAB.*) *Subject Headings: 1. Numerical forecasting 2. Forecast improvements 3. Meteorological networks.—Author's abstract.*

8F-91

551.509.312:519.2

Ogawara, M. and Tomatsu, K., Stochastic numerical prediction for the 500 mb height along the latitude 45°N. *Journal of Meteorological Research*, Tokyo, 7(4):191-200, June 1955. 2 figs., 12 refs., eqs. In Japanese; English summary p. 191. **DWB**—The aim of this paper is to synthesize the idea of so-called numerical prediction and that of stochastic prediction into a systematic theory. The discussion is developed by taking as an example Charney-Eliassen's numerical prediction scheme which was published in *Tellus*, 2:38-54, 1949 (see 2.48, Feb. 1950, *MAB*). A stochastic prediction for a constant pressure height $z(x,t)$ along a latitude circle can be derived from the stochastic prediction for a set of Fourier coefficients of the $z(x,t)$. Our stochastic prediction scheme is constructed so that it includes Charney-Eliassen's method as a part of the scheme and the prediction is expressed by a sort of probability distribution. A numerical example is carried out for the prediction of the 500 mb height profile along the 45°N latitude circle in Jan. 1946. A similar idea may be also applied, at least in its principle, to nonlinear numerical prediction schemes which have been recently developed. (*Same item as 8.1-164, Jan. 1957, MAB.*) *Subject Headings: 1. Numerical forecasting 2. Probability forecasting 3. Charney-Eliassen method.—Authors' abstract.*

8F-92

551.509.3:551.515.2

Okamura, Y., Barotropic forecasting of a typhoon by means of gradient flow pattern. *Journal of Meteorological Research*, Tokyo, 8(6):335-342, July 1956. 12 figs., 4 refs., 23 eqs. In Japanese; English summary p. 335. **DWB, DLC**—The geostrophic model available for conventional numerical forecasting is inapplicable to weather maps having complicated pressure patterns like in the case of a typhoon. In order to improve this point it is considered to use the gradient flow pattern for numerical forecasting of typhoons. This method does not contain the procedure to separate apparently the general field from the typhoon but contains the computation of the vorticity with a gradient model in the typhoon area. In this paper the simplest barotropic model of the atmosphere is con-

sidered. As a result of using a gradient model the vorticity is a little smaller at the typhoon center and the field carrying vorticity is almost the same as in geostrophic cases. The method also provides a simple means for predicting the typhoon center. (*Same item as 7K 191, Nov. 1956, M.A.B.*) *Subject Headings:* 1. Numerical typhoon forecasting 2. Barotropic models 3. Gradient flow patterns.—*Author's abstract.*

8F-93

551.511.2:532.5:551.509.312

Palm, Enok. *On the stability of linear flow.* *Norske Videnskaps-Akademie i Oslo. Institutt for Væ- og Klimaforskning, Report, No. 2, 1955.* 6 p. figs., 6 refs., 17 eqs. DWB—Green's transform of the equation of motion for 2-dimensional perturbation of linear flow is applied to obtain some properties of exponential unstable eigensolutions. Application would be to numerical prediction. (*Same item as 8.5-192, May 1957, M.A.B.*) *Subject Headings:* 1. Two-dimensional fluid flow 2. Stability of waves 3. Green's function 4. Numerical forecasting.—*From author's abstract.*

8F-94

551.509.312 551.511(02)

Panofsky, Hans A., *Introduction to dynamic meteorology.* University Park, College of Mineral Industries, Pennsylvania State Univ., 1956. 243 p. 59 figs., 251 eqs. DLC—Basic principles of dynamic (numerical) forecasting, methods of treatment of the fundamental equations for dynamic forecasting (nondivergence, vertical integration, potential vorticity techniques), and specific models used in numerical weather prediction (linear or nonlinear, 1, 2, 2½ and 3 dimensional models, Fjörtoft's method, etc.) are explained in Ch. 5 (p. 151-180) of this textbook. The mathematical treatments involved are outlined. (*For fuller abstract, see 7.11-10, Nov. 1956, M.A.B.*) *Subject Headings:* 1. Numerical forecasting 2. Textbooks 3. Dynamic meteorology textbooks.—*G.T.*

8F-95

551.509(02) 551.509.312

†Petterssen, Sverre, *Weather analysis and forecasting.* 2d ed. N. Y., McGraw-Hill, 1956. 2 Vol. 428 and 266 p. figs., tables, eqs., bibliogs. DWB, DLC—The first volume of this important textbook covers the theory and some applications of equations of motion (and derived equations) to analysis of pressure, temperature and wind fields and to numerical prediction. The chapter on numerical forecasting (Ch. 18, p. 371-387) was written by ARNT ELIASSEN of Oslo University. In it the problem of applying Richardson's equations to numerical computation techniques, and various approaches to this problem are discussed, namely the geostrophic approximation, the quasi-geostrophic equations, the barotropic model and models involving two or more levels. The use of conformal charts and computation by using a rectangular grid of points are explained. Ch. 19 (p. 388-402) deals with Fjörtoft's graphical method of solving equations of the type used in numerical forecasting. In Vol. 2, Ch. 23 on *Quantitative Precipitation Forecasting*, by J. C. Thompson, contains a paragraph (p. 97-98) on an instance of successful numerical precipitation forecasting reported by SMAGORINSKY and COLLINS. (*For fuller abstracts on Vol. 1, see 7.8-4, Aug. 1956; on Vol. 2, see 8.4-7, April 1957, M.A.B.*) *Subject Headings:* 1. Numerical forecasting 2. Fjörtoft's graphical method 3. Dynamic meteorology textbooks. I. Eliassen, Arnt II. Thompson, J. C.—*G.T.*

8F-96

551.509.31

†Petterssen, Sverre (*ed.*), *Studies in weather analysis and forecasting.* Chicago. Univ. Dept. of Meteorology, Contract AF 19(604)-1293, Final Report, Feb. 1957. Each article repaged. figs., tables, refs., eqs. DWB—This voluminous report consists of 17 articles produced as a result of contract work at the Univ. of Chicago from Nov. 25, 1954 to Feb. 24, 1957. The papers deal with general problems of forecasting, verification of prognostic charts, with graphical integration of prediction models and their application, with quantitative precipitation forecasting, cyclogenesis, hurricane forecasting, and with problems of moisture analysis, zonal index and orographic frictional influences. (*For listing of contents see Pt. III, p. 850 this issue.*) *Subject Headings:* 1. Weather forecasting 2. Synoptic analysis.—*M.R.*

8F-97

551.509.3

Petterssen, Sverre, *Review and summary of recent forecasting research.* (In: Chicago. Univ. Dept. of Meteorology, Contract AF 19(604)-1293, Final Report, Feb. 1957. Sec. A. (51 p.) 7 figs., 6 tables, 33 refs., eqs.) DWB—The main currents of research and application of research to the problem of forecasting are reviewed systematically: dynamic forecasting by V. Bjerknes (1904) and Richardson (1922), statistical-climatological forecasting as outlined by Wadsworth and Malone (1951-56), types and analogues (Bauer, Krick, Elliott, Bowie and Weightman), objective aids (regression equations or scatter diagrams), computation and extrapolation. In one section the dynamic (numerical) models are discussed. It is shown that the one-level (barotropic) model is superior to the 2 or 3-level models because untenable assumptions are involved in practical work with the latter. Verification techniques, graphical prediction experiments conducted at Chicago

in 1956, errors due to Rocky Mountains, etc., are discussed. *Subject Headings: 1. Weather forecasting 2. Numerical forecasting.—M.R.*

8F-98

551.511:551.513.1

Phillips, Norman A., **Energy transformations and meridional circulations associated with simple baroclinic waves in a two-level, quasi-geostrophic model.** *Tellus*, 6(3):273-286, Aug. 1954. 5 figs., table, 24 refs., 36 eqs. **MH-BH**—The changes in geostrophic kinetic energy predicted by the "2½ dimensional" quasi-geostrophic vorticity equations without friction are shown to be compatible with the mechanical energy equation. The second-order effects on a zonal current due to the presence of very simple unstable baroclinic waves are then analysed, using a two-level model of finite lateral width without friction or heat sources. In addition to the poleward transport of sensible heat and the creation of kinetic energy by these waves, it is shown that they are accompanied in this model by a weak meridional circulation. This circulation consists of an indirect cell in middle latitudes with direct cells to the north and south. The possible importance of this mechanism in providing appropriately distributed sources and sinks of relative zonal momentum (and therefore in prescribing the distribution with latitude of the surface zonal winds) is demonstrated with the aid of WINGER's observations of the horizontal momentum transfer by eddies during Jan. 1946. Finally, it is shown that about 95% of the perturbation energy in the unstable waves in this type comes from the "potential energy" of the basic current, the small remainder coming from the kinetic energy. (Same item as 6.10 127, Oct. 1955, MAB.) *Subject Headings: 1. Energy transformation 2. Kinetic energy in atmosphere 3. Meridional circulation 4. Baroclinic models.—Author's abstract.*

8F-99

551.513.1:681.14

Phillips, Norman A., **The general circulation of the atmosphere: a numerical experiment.** *Royal Meteorological Society, Quarterly Journal*, 82(352):123-164, April 1956. 14 figs., 8 tables, 62 refs., 72 eqs. Also review in: *Nature*, London, 178(4525):129, July 21, 1956. **DWB**—Present knowledge of the atmospheric circulation is summarized. A 2-level geostrophic model is set up and equations of motion, viscosity, etc., including friction and non-adiabatic effects, are derived. Then starting from an atmosphere at rest, the development of the circulation is calculated with an electronic computer and continued for 31 days at intervals of 1 day. Charts are given (without geographical reference; surface features are ignored) showing calculated 1000 mb contours and 500 mb temperatures at 3 day intervals (days 11-26). The flow patterns developed include a jet, zonal surface westerlies and a large disturbance. In addition, the variation with latitude and time of mean meridional and zonal velocity and 500 mb temperature are plotted and momentum and energy budgets and changes tabulated. An appendix sets out the numerical forecasting procedure. (On awarding of Sir Napier Shaw Prize for this paper see 8.5-66, May 1957, MAB.) (Same item as 7.9-142, Sept. 1956, MAB.) *Subject Headings: 1. Atmospheric circulation calculations 2. Numerical forecasting 3. Baroclinic models.—C.E.P.B.*

8F-100

551.509.312

Phillips, N. A., **A coordinate system having some special advantages for numerical forecasting.** *Journal of Meteorology*, 14(2):184-185, April 1957. 4 refs., 10 eqs. **DWB**—Suggests replacing vertical coordinate p in x, y, p, t system by $\sigma = p/\pi$, where π is pressure at ground level. Advantages are that vertical advection terms are zero at bottom of atmosphere and effect of orography can be simply introduced. *Subject Heading: 1. Numerical forecasting.—C.E.P.B.*

8F-101

551.509.312:681.14

Pinkerton, J. M. M., **Recent developments in electronic computers.** *Endeavour*, London, 16(61):36-41, Jan. 1957. 4 figs., 31 refs. **DLC**—Uses of digital and electronic computers, the principles involved and the technical details of the construction and operation of British computers (Manchester and Cambridge Universities and Teddington) and limitations are described and illustrated. Experiments with numerical weather prediction by Bushby and Hinds are mentioned. *Subject Headings: 1. Numerical forecasting 2. Electronic computers.—M.R.*

8F-102

551.509.312

Platzman, G. W., **The computational stability of boundary conditions in numerical integration of the vorticity equation.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 7:29-40, 1954. 5 figs., 2 refs., 21 eqs. English, German and French summaries p. 29. **DWB**—In forecasting large-scale flow patterns by numerical integration of the vorticity equation over a limited area, errors are introduced by the assumed boundary conditions and penetrate inwards during the iteration process. Three cases of boundary conditions which have been used at Princeton are examined. It is shown that the degree of computational instability depends on the initial assumptions as to boundary vorticity. (Same item as 5.11-50, Nov. 1954, MAB.) *Subject Headings: 1. Numerical forecasting 2. Truncation errors.—C.E.P.B.*

8F-103

551.509.312

Reed, Richard J., **A graphical method for preparing 1000-millibar prognostic charts.** *Journal of Meteorology*, 14(1):65-70, Feb. 1957. 4 figs., 2 tables, 6 refs., 24 eqs. **DWB**—The Fjörtoft graphical method is extended to preparation of 1000 mb prognostic charts, without ESROQUE's assumption that advection of surface vorticity by the thermal wind is zero. Some short cuts are suggested. Three 12-hr forecasts of 1000 mb height changes were made for eastern and central N. America; these gave correlations of 0.88-0.93 with observed changes (τ -m-s error 110-140 ft). **Subject Headings:** 1. Numerical forecasting 2. Fjörtoft's graphical method.—C.E.P.B.

8F-104

551.513.1:551.511

Riis, Eyvind, **A discussion of long waves in a baroclinic model atmosphere.** *Norske Videnskaps-Akademi i Oslo. Institutt for Vaer- og Klimaforskning, Report, No. 4, 1955.* 11 p. fig., 3 refs., numerous eqs. **DWB**—In the paper an attempt is made to take into consideration terms which are usually neglected as unimportant in trying to find stability criteria for long waves in the atmosphere. These terms will give rise to singularities in the differential equation for the vertical velocity w (or for the other dependent variables) of quite another character than met with when neglecting the terms (Sec. 2). The equation will be more difficult to discuss, but the effect of these singularities can perhaps have an essential influence on the stability criteria. In Sec. 3, it is shown that extremely long waves are stability waves in a statically indifferent atmosphere. In Sec. 5, it is shown that there are solutions with singularities which for all wave-lengths, are exponentially increasing with time. (Same item as 7.9-143, Sept. 1956, MAB.) **Subject Headings:** 1. Baroclinic models 2. Long wave stability.—Author's abstract.

8F-105

551.509.312:551.577.2

Saito, N., **On the calculation of the vertical p -velocity concerning the wet adiabatic process.** *Meteorological Society of Japan, Tokyo, Journal, Ser. 2, 34(5):266-270, Oct. 1956.* 5 figs., 5 refs., 6 eqs. **DWB, DLC**—For the purpose of integration of vorticity equation, or the numerical forecasting of rainfall amounts, the vertical p -velocity in a state of saturation is derived from the equation of vertical p -vorticity and the conservation of the equivalent potential temperature. The difference of vertical p -velocities in the dry and wet adiabatic processes is estimated. Effects of condensation on the height change are discussed. **Subject Heading:** 1. Numerical precipitation forecasting.—Author's abstract.

8F-106

551.511:551.547:551.557

Saltzman, Barry (M.I.T.), **Note on simple assumptions regarding the baroclinic structure of the atmosphere.** *Tellus, Stockholm, 7(3):385-387, Aug. 1955.* table, 3 refs., 2 eqs. **DLC**—The author points out "some observed short-comings of the evaluation of the baroclinic term $\int_0^{2\pi} C'\overline{\tau}C'_R d\theta$ (in the equation of LORENZ)

$$\tau = \frac{p_0}{g} R^2 \int_0^{2\pi} \overline{C_T} \overline{C_R} d\theta + \frac{p_0}{g} R^2 \int_0^{2\pi} C'_T C'_R d\theta,$$

where τ local momentum transport" by means of an assumption regarding the vertical variation of the wind, as compared with a "three dimensional" evaluation of the baroclinic contribution by means of data at five levels of the atmosphere. (Same item as 7.11-171, Nov. 1956, MAB.) **Subject Heading:** 1. Baroclinic models.—I.L.D.

8F-107

551.509.312

§Sanderson, Alan N. and Thomas, Charles F. (both, WBAN Analysis Center, U. S. W. B., Wash., D. C.), **Application of Fjörtoft vorticity technique.** Wash., D. C., U. S. Weather Bureau, Aug. 10, 1954. 8 p. 10 figs., 3 refs. **DWB**—FJÖRTOFT'S (1952) graphical method for objective preparation of 500 mb progression charts has been modified to facilitate quick compilation at the WBAN analysis center. The method involves 4 stages of computation which are discussed step by step: computation of: 1) space-mean flow pattern, 2) of relative vorticity field, and 3) advection of relative vorticity field with the space-mean flow pattern. The fourth step, computation of the 500-mb height changes for the period and addition to the original 500 mb chart to obtain the prognostic chart, is eliminated and instead 36-hr compilation of field by means of acetate overlays is employed. Techniques as applied to situation over North America on April 15-17, 1954, are described and illustrated. (Same item as 7.4-117, April 1956, MAB.) **Subject Headings:** 1. Fjörtoft's graphical method 2. Objective 500 mb progression chart preparation.—M.R.

8F-108

551.509.312:551.515.23

Sasaki, Y. and Miyakoda, K., **Numerical forecasting of the movement of cyclone.** *Meteorological Society of Japan, Journal, Ser. 2, 32(11/12):325-335, Nov./Dec. 1954.* 10 figs., 4 refs., 15

eqs. Also: Sasaki, Y., **Barotropic forecasting for the displacement of typhoon.** *Ibid.*, 33(1):1-8, Feb. 1955. 4 figs., 7 refs., eqs. Also: Sasaki, Y. and Miyakoda, K., **Prediction of typhoon tracks on the basis of numerical weather forecasting method.** (In: UNESCO Symposium on Typhoons, Tokyo, Nov. 9-12, 1954, Proceedings, pub. 1955. p. 221-233.) DWB—In the first paper the dynamical role of the barotropic model of cyclones is analyzed; removing a circular vortex from a weather chart the interaction between the vortex and the residual field is studied theoretically. In the second paper it is shown that difficulties of applying iterative processes to calculating the motion of typhoons can be overcome by calculating the displacement of the point of minimum pressure relative to the residual field. Equations for the components of motion are given and applied to typhoons "Tess" and "Nina" using the 700 mb contours, with good agreement between predicted and observed positions after 12 hrs. (For fuller abstracts, see 71-150, 71-171 and 71-172, Sept. 1956, MAB.) **Subject Headings: 1. Numerical typhoon forecasting 2. Typhoon track forecasting.**

8F-109

551.509.312

Sawyer, J. S., **Some calculations of 24-hour changes of 500-mb height and 1000-500-mb thickness based on a two-parameter model atmosphere.** I.U.G.G. Association of Meteorology, Rome, Sept. 1954, *Scientific Proceedings*. London, Butterworth, 1956. p. 477-496. 5 figs., table, 8 refs., 3 eqs. DWB—The author describes the results of twelve integrations of the equations of motions with respect to time in order to determine the degree of success with which it is possible to predict over periods of 24 hrs the movement and development of depressions and anticyclones. The fundamental assumptions and approximations made in deriving the equations for integration and the equations to be integrated are presented. Correlation coefficients between the calculated and observed changes in the parameters, namely 500 mb height and 1000 mb thickness and the computed parameters are presented in a table and by means of charts. The sources of error of the computed charts, in particular the effect of heating of air over the sea, the effect of boundary conditions and the choice of the 500 mb level to define the parameters of the model are analyzed. **Subject Headings: 1. Numerical forecasting 2. Equations of motion 3. Baroclinic models.—I.L.D.**

8F-110

551.511

Sherman, Leon, **On periodic barotropic flow patterns whose mean flow velocity profile is initially sinusoidal.** California. Univ. at L. A. Dept. of Meteorology, Contract AF 19(604)-728, Scientific Report, No. 2, May 1954. 18 p. 3 figs., 2 tables, 6 refs., eqs. MH-BH—This paper considers the doubly two-dimensional flow of a homogeneous inviscid fluid. Such a flow is characterized by a stream function. We consider a model which at the initial time consists of a disturbance, whose stream function varies sinusoidally along each coordinate direction, added to a flow parallel to one of the coordinate directions, whose speed profile is sinusoidal. This initial flow pattern has trough and ridge lines normal to the direction of the zonal flow. The initial tilting of these patterns and the flow of kinetic energy between disturbance and zonal current are considered. Then a procedure for the numerical integration of non-steady cases is set up and the errors involved are estimated. As a byproduct a simple means of eliminating an error of the order of 5 to 7% from numerical forecasting procedures is pointed out. (Same item as 6.5-112, May 1955, MAB.) **Subject Headings: 1. Barotropic models 2. Equations of motion 3. Numerical forecasting.—Author's abstract.**

8F-111

551.509.312

Shuman, Frederick G. (U. S. W. B., Wash., D. C.), **The analytic solution of a linear partial finite difference equation.** U. S. Joint Numerical Weather Prediction Unit, Technical Memorandum, No. 4, March 2, 1955. 9 p. 5 figs., 19 eqs. DWB—A solution of a finite difference equation obtained by numerical means is compared with the solution of the partial differential equation from which the difference equation was derived. These equations apply to long waves and extratropical cyclones and anticyclones. The comparative analysis sheds some light on the accuracy of the numerical computation method with particular reference to the relation of the analyzed wavelength to the length between points in the grid used as a basis for the difference equations. **Subject Headings: 1. Numerical forecasting 2. Difference equations.—G.T.**

8F-112

551.509.312

Shuman, Frederick G. (U. S. W. B., Wash., D. C.), **Method for solving the balance equation.** U. S. Joint Numerical Weather Prediction Unit, Technical Memorandum, No. 6, May 23, 1955. 12 p. 2 refs., 32 eqs. DWB—This paper, according to the author, presents a solution of the balance equation in isobaric coordinates: $2\psi_{xy}^2 - 2\psi_{xx}\psi_{yy} - f(\psi_{xx}\psi_{yy}) - \phi_{xx} - \phi_{yy} = 0$, where ψ is the stream function; f , the coriolis parameter and ϕ , the geopotential. The above equation is treated as a boundary value problem (provided the equation is not fundamentally hyperbolic). The discussion is not concerned with proofs of convergence or relaxation methods applied to the equation, but with the method of handling problems which arise from the quadratic nature of the equation. (Same

em as 7.4-118, April 1956, MAB.) *Subject Headings:* 1. Numerical forecasting 2. Balance equation.—M.R.

8F-113

551.509.312:519.28

Shuman, Frederick G. (U. S. W. B., Wash., D. C.), **Method of designing finite-difference smoothing operators to meet specifications.** U. S. Joint Numerical Weather Prediction Unit, *Technical Memorandum*, No. 7, June 2, 1955. 8 p. 6 figs., 12 eqs. DWB—Theory and practice of smoothing or use in constructing synoptic charts by machine (IBM-701 computer) methods. The four parts of the paper are concerned with: (1) the smoothing element; (2) the design of multi element operators; (3) smoothing in 2 dimensions and (4) an example of the construction of a smoothing operator. In the latter case it is set up so as to eliminate components of a wave length of $4 \Delta x$ in the 1000-800 mb field while retaining components longer than $10 \Delta x$ for predicting thickness field by half-hourly intervals for 24-hours (48 smoothing steps, allowing a 10% change due to smoothing). Two 9-point smoothing operators were used. Charts show thickness field unsmoothed, smoothed once, 11 and 5 times, respectively, and what features are eliminated by the smoothing. *Subject Headings:* 1. Smoothing techniques 2. Numerical forecasting.—M.R.

8E-114

551.509.312:551.513.1

Shuman, Frederick Gale (U. S. W. B., Wash., D. C.), **Spurious deepening in baroclinic prediction models.** U. S. Joint Numerical Weather Prediction Unit, *Technical Memorandum*, No. 9, Jan. 3, 1956. 8 p. 2 figs., 5 refs., 11 eqs. DWB—Neglecting a term which represents a finite vertical speed of propagation of influences leads to over-forecasting deepening of cyclones or anticyclones (over-estimation of divergence in anticyclones and underestimation in cyclones). This could be corrected if the non-linearity of the quasi-geostrophic modes is reorganized, "but the non-linear effects must be coupled with an accounting of the ageostrophic vorticity in cyclones." An example is worked out theoretically, but several difficulties remain to be solved before accurate baroclinic forecasts can be made by Joint Numerical Weather Prediction. *Subject Headings:* 1. Numerical forecasting 2. Baroclinic models 3. Spurious deepening of cyclones and anticyclones.—M.R.

8F-115

551.509.312:551.509.54

Smagorinsky, J. and Collins, G. O., **On the numerical prediction of precipitation.** *Monthly Weather Review*, Wash., D. C., 83(3):53-68, March 1955. 8 figs., 15 refs., 40 eqs. Preliminary version as American Meteorological Society. District of Columbia Branch, *Proceedings of the Workshop on Numerical Weather Prediction*, Wash., D. C., June 1954. p. 50-80. 8 figs., 15 refs., 40 eqs. DWB—With the three-dimensional field of velocity predicted by numerical methods it is possible to predict the moisture distribution and hence the occurrence of large-scale saturation. A three-parameter model was used to predict the 12-hr precipitation for the early stages of the storms of Nov. 24, 1950 and Nov. 5, 1953, neglecting cloud storage, supersaturation, a possible lack of condensation nuclei, evaporation from falling droplets, and moisture sources. Large-scale orographic influences were taken into account. A quantitative comparison of the predicted rainfall with the correspondingly large-scale smoothed observed precipitation indicated a skill comparable to that of the predicted flow. An examination of the small-scale observed rainfall indicated that in these cases convective instability resulted in large standard deviations from the large-scale average. Numerical prediction of regions of convective instability, which is also shown, could for the time being be utilized for subjective interpretation. (Same item as 7.7-115, July 1956, MAB.) *Subject Heading:* 1. Numerical precipitation forecasting.—From authors' abstract.

8F-116

551.509.312

Smedley, David, **Test of numerical five day contour forecast.** U. S. Weather Bureau, [1955?] 6 p. 3 refs., 7 eqs. Typescript. DWB—During 1954, 5-day forecasts were made on an experimental basis (for 18, 5-day periods) to test a numerical method suggested by J. NAMIAS. The method was based on the relation of the variability of monthly and 5-day height anomalies, and the similarity of 5-day mean maps to individual maps during the 5-day period. The numerical method was tested against two other methods and the official method used in the Weather Bureau Extended Forecast Unit found to be slightly better. (Same item as 7.8-93, Aug. 1956, MAB.) *Subject Headings:* 1. Numerical 5-day forecasting 2. Forecast evaluation 3. U. S. Weather Bureau. Extended Forecast Division.—M.R.

8F-117

551.509.312:681.14

Stockholm. Tekniska Högskolan. Institute of Meteorology, **Results of forecasting with the barotropic model on an electronic computer (BESK).** *Tellus*, 6(2):139-149, May 1954. 11 figs., table, 4 refs., 4 eqs. Comments by A. M. Grant and reply by B. Bolin, *Ibid.*, 7(2):275-276, May 1955. DLC—A series of twenty-four 24-hr forecasts have been completed using the barotropic model of the atmosphere. The results of these forecasts are better than previous tests with this

model had indicated. The average correlation coefficient between computed and observed height changes of the 500 mb surface is 0.77, the error in the forecast height changes is 89 m against an average observed change of 121 m. The errors are mainly due to the following factors: 1) Erroneous assumptions at the boundary of the forecast area, 2) Inaccurate analysis of the initial data over the Atlantic, 3) Inaccuracy in forecasting components of the motion of a scale only a few times larger than the grid size, 4) Baroclinic developments. The computations indicate that the present result may be improved considerably by trying to eliminate errors under (1)–(3). (*Same item as 6.11 146 Nov. 1955, MAB.*) *Subject Headings:* 1. Barotropic models 2. Numerical forecasting 3. Forecast improvement. I. Grant, Alison M. II. Bolin, Bert.—*Author's abstract.*

8F-118

551.509.312

Sutton, Oliver Graham (*Dir. Met. Office, London*), **Comparison of forecast charts made by ordinary methods and those made by high-speed computing.** Remarks presented before the National Science Foundation-Univ. of Calif. at Los Angeles Conference on the Significance and Possibilities of High-Speed Computing in Meteorology and Oceanography, May 13–15, in Los Angeles, Calif. [1955?] 7 p. 5 eqs. DWB—An evaluation of prognostic charts during 3 periods prepared by machine using a 2 parameter model, and by ordinary prebariatric methods (Jan. 27, 1952 to Jan. 30, 1953), shows that numerical methods give comparable results (as good as, or better than subjective methods) for areas well away from the boundary of the grid, and for situations where the subjective methods were also satisfactory, but for tricky situations the numerical methods were as bad as, or worse than, the subjective. In the case of the Jan. 30, 1953 storm that damaged the channel coasts, the numerical methods would have exaggerated the intensity of the systems. (*Same item as 7.4 119, April 1956, MAB.*) *Subject Headings:* 1. Numerical forecasting 2. Forecast evaluation 3. Baroclinic models 4. Prebariatric charts.—M.R.

8F-119

551.509.312:551.515.2

Suzuki, K., **An experiment in numerical forecasting with the barotropic model.** *Journal of Meteorological Research*, Tokyo, 8(8):523–527, Oct. 1956. 8 figs., 3 refs. In Japanese. DWB—DLC—A formula for numerical forecasting is developed and applied to two cases of typhoons near Japan. Predicted and actual typhoon tracks and synoptic charts are presented. *Subject Headings:* 1. Numerical typhoon forecasting 2. Barotropic models.—G.T.

8F-120

551.509.312

Syōno, S.; Gambo, K.; Miyakoda, K. et al. (*Geophys. Inst., Tokyo Univ.*), **Report on the numerical prediction of the 500 mb contour height change with double Fourier series method.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 33(4):174–176, Sept. 1955. 11 figs., table, ref. DWB, DLC. Reprinted in: *Collected Meteorological Papers*, Tokyo, 6(1/2); Dec. 1955. Contribution No. 82. MH-BH—Reports barotropic test forecasts made on a FACOM 100 computer using a double Fourier series method. Prognostic 500 mb contour charts prepared in connection with a storm over Japan in May 1954 are presented. Considerable discrepancy between predicted and observed values of 12-hr 500 mb height changes is partly attributed to overfiltration of small scale wave components. To eliminate this discrepancy the same method was applied to a smaller region and smaller scale waves were included in the analysis which led to a marked improvement of the results. *Subject Headings:* 1. Numerical forecasting 2. Barotropic models 3. Fourier series. I. Aihara, M. II. Manabe, S. III. Katow, K.—G.T.

8F-121

551.509.312

Syōno, S.; Gambo, K.; Miyakoda, K.; Aihara, M. and Manabe, S. (*all, Geophysical Institute, Tokyo Univ.*), **A note on the barotropic forecast using a moving coordinate system.** *Meteorological Society of Japan, Journal*, Ser. 2, 34(3):164–168, June 1956. 6 figs., 5 refs., 6 eqs. DWB, DLC—Using the equations of motion on the moving coordinate which moves with the angular velocity of the westerlies, we made barotropic forecasts over the Far East, and the results of these forecasts are presented. In these computations, the Double Fourier Series method which we have reported already in this *Journal* (see 8F-120 above), is used. *Subject Headings:* 1. Numerical forecasting 2. Barotropic models 3. Moving coordinate system.—*Authors' abstract.*

8F-122

551.509.312:551.511

Thompson, Philip D., **The barotropic model.** (In *American Meteorological Society, District of Columbia Branch, Proceedings of the Workshop on Numerical Weather Prediction, Wash., D. C., June 1954.* p. 15–27. 3 figs., 10 eqs.) DWB—Assuming identical topographies in all isobaric surfaces, a forecasting model is developed, based on the vorticity and continuity equation. The underlying theoretical assumptions and limitations are outlined. The actual analysis in eight steps is done for the 500 mb surface, where the wind is slightly greater than the vertically integrated

ean wind, weighed according to density. *Subject Headings:* 1. Numerical forecasting 2. Barotropic models.—A.A.

8F-123

551.509.312:551.511:551.551

Thompson, Philip Duncan. Prognostic equations for the mean motions of simple fluid systems and their relation to the theory of large scale atmospheric turbulence. *Tellus*, 6(2):150-164, May 1954. 6 refs., 21 eqs. **DLC**—By making use of the mathematical properties of certain special types of weighted means—taken either areawise or timewise—it has been shown that a variable's deviation from its mean can be expressed in terms of the mean itself. This result has been used to derive a closed system of equations for the mean motion of an incompressible autobarotropic fluid. Comparison of the equations for area-averaged and time-averaged motion reveals that the area mean has certain advantages, inherent in the form of the equation for the unaveraged motion. The eddy transport for the case of "strong averaging" is contrasted with that derived from the classical "mixing-length" theory of eddy diffusion. The usual restrictions on the statistics of eddy fluctuations are found to be inconsistent with the unrestricted form of the eddy transport. Finally, it has been shown that these methods can be extended to the derivation of closed systems of equations for the mean motions of simple baroclinic fluids. *Same item as 6.11-149, Nov. 1955, MAB.)* *Subject Headings:* 1. Numerical forecasting 2. Turbulence theory.—*Author's abstract.*

8F-124

551.509.312:551.511

Thompson, Philip D. (U. S. A. F. Cambridge Res. Center, Mass.). A note on the integration of the vorticity equation for quasi-geostrophic flow. *Tellus*, 6(4):319-325, Nov. 1954. figs., 7 refs., 4 eqs. **DLC**—By the transformation of integrals arising from the solution of the "quasi-geostrophic" equations for barotropic and simple types of baroclinic flow, it is shown that the isobaric height tendency can be expressed in terms of first derivatives of the heights of isobaric surfaces. This demonstrates that the procedure by which the equations are solved must tend to cancel or average out the large percentage errors in the geostrophic vorticity advection—i.e., errors in second and third order finite-differences. The height tendency may be computed by a simple graphical procedure, which is carried out directly on analyzed contour charts and which involves a minimum of multiplications. *(Same item as 6.11-148, Nov. 1955, MAB.)* *Subject Headings:* 1. Numerical forecasting 2. Vorticity equations.—*Author's abstract.*

8F-125

551.509.312

Thompson, Philip D., Reduction of truncation errors in the computation of geostrophic advection and other Jacobians. U. S. Joint Numerical Weather Prediction Unit, Technical Memorandum, No. 1, Jan. 9, 1955. [16 p.] figs., refs., eqs. Also his: Reduction of truncation errors in the computation of geostrophic vorticity, the Laplacian operator and its inverse. *Ibid.*, No. 2, Feb. 8, 1955. [10 p.] refs., 5 eqs. Also: Knighting, E. (*British Met. Office*), The reduction of truncation errors in symmetrical operators. *Ibid.*, No. 3, Feb. 11, 1955. [6 p.] refs., 13 eqs. **DWB**—In computing horizontal advection of some quantity q and the geopotential ϕ , a truncation error arises in the process of approximating derivatives by differences between values of ϕ and q at points spaced in a grid of finite distances. The "method of inverse-averaging" described in this paper reduces most of the systematic truncation error (i.e., the part which does not depend on the grid's orientation) or wavelengths of 4-6 grid intervals and practically eliminates it for wavelengths of 8 grid intervals or more. The method involves differencing once along the rows and columns of a fixed grid and again along the diagonals of the same grid. In machine computation this can be carried out by simple operations and does not place excessive demands on internal storage capacity. In the second paper the same general method is applied to the problem of identification and reduction of the systematic truncation error in computing the Laplacian of any variable, a problem frequently arising in the computation of geostrophic vorticity.—As an alternative to Thompson's approach developed in the first paper, Knighting proposes an operator formed by rotating the grid through an angle $\pi/4$ and extending the mesh length. *Subject Headings:* 1. Numerical forecasting 2. Truncation errors.—G.T.

8F-126

551.509.312

Thompson, Philip D., Iterative method for solving an elliptic equation with variable coefficients and its convergence criterion. U. S. Joint Numerical Weather Prediction Unit, Technical Memorandum, No. 5, March 8, 1955. 10 p. refs., 12 eqs. **DWB**—As an alternative to the relaxation method for solving an equation of nongeostrophic motion in close finite form, the author proposes a method of successive approximations. According to the suggested procedure an arbitrary value is chosen for the term representing the velocity potential for the irrotational part of horizontal motion (ϕ). With this arbitrary value the right hand side of the equation is first computed, then the whole equation is solved for ϕ . The value of ϕ thus obtained is again substituted into the right hand side, and the equation solved for a second time, giving another value of ϕ . This is repeated until the

difference between the last two approximations to ϕ is less than the permissible error. In a detailed analysis this method is shown to lead to a rapidly convergent sequence under proper conditions. *Subject Headings: 1. Numerical forecasting 2. Difference equations 3. Iterative methods.—G.T.*

8F-127

551.509.312

Thompson, Philip Duncan (*Joint Numerical Weather Prediction Unit, Wash., D. C.*), **Dynamical prediction. Weatherwise**, Boston, 8(6):145-149, Dec. 1955. 3 photos. DWB. Also Summary: **Una maquina que pronóstica el tiempo.** [A machine which forecasts the weather.] *Revista Meteorológica del Peru*, Lima, 2(3):61, Oct., Dec. 1956. DWB—The history of numerical weather prediction from the first use of the hydrodynamical equations in meteorology (HELMHOLTZ, 1858) to the work of V. BJERKNES, L. F. RICHARDSON (1922) and more recently CHARNEY (1948), ROSSBY, EADY, ELIASSEN, SAWYER, BUSHBY and PHILLIPS as well as the author, is reviewed and the merits of the generalized barotropic model (1952-3) for use by high speed computers, such as are used by Joint Numerical Weather Prediction at Suitland (IBM-701), where in one hour, a 24-hr forecast of the 100, 700 and 500 mb heights and the vertical speeds at intervening levels can be made. Automatic data input improvements are being introduced now. *Subject Heading: 1. Numerical forecasting.—M.R.*

8F-128

551.509.312

Thompson, Philip Duncan (*Major, U. S. A. F.*), **A heuristic theory of large-scale turbulence and long-period velocity variations in barotropic flow.** Wash., D. C., Joint Numerical Weather Prediction Unit, Jan. 18, 1956. 52 p. 7 figs., 7 refs., 33 eqs. DWB. Also in *Tellus*, Stockholm, 9(1):69-91, Feb. 1957. DLC—An attempt to extend the mechanical theory used in numerical forecasting (barotropic model), assuming no energy input or thermodynamic changes. It is shown that the mean zonal flow is related to the eddy velocity in a way that lends itself to quantitative calculations, and further that the changes in eddy velocity are related, in turn, to the mean flow. If the scale of the eddy is comparable to the width of the flow, then the eddy statistics do not depend very much on the flow pattern (i.e., intensity of turbulence and eddy scale). Applications to movement of jets, blocking, etc. show apparent validity of this simple numerical method. *Subject Headings: 1. Numerical extended forecasting 2. Barotropic models.—M.R.*

8F-129

551.509.312

Thompson, Philip D. (*Joint Numerical Weather Prediction Unit, U. S. W. B., Wash., D. C.*), **Ten months of operational numerical weather prediction (Abstract of the paper).** *New York Academy of Sciences, Transactions*, Ser. 2, 18(6):555-556, April 1956. DLC—The first prognostic weather maps on a routine basis were issued on May 6, 1955. The predictions are formulated by means of IBM 701 electronic computer. Forecasting is carried out on the basis of baroclinic and barotropic models. The interpolation of data is made by the computer. A comparison of the baroclinic machine forecasts with those prepared by the NWAC forecasters showed that there is no difference in skill for 24-hr forecasts for the 500 mb level. *Subject Heading: 1. Numerical forecasting.—I.L.D.*

8F-130

551.509.312

Thompson, P. D. and Gates, W. Lawrence, **A test of numerical prediction methods based on the barotropic and two-parameter baroclinic models.** *Journal of Meteorology*, Boston, 13(2):127-141, April 1956. 14 figs., table, 12 refs., 27 eqs. DWB—A two-parameter baroclinic model for vertically integrated flow is derived under the assumption of an isogonal geostrophic wind shear, and constitutes a generalization of the theory of equivalent baroclinic flow. The computational procedures used to apply both this theory and that for purely barotropic flow to the production of numerical forecasts are described in detail, and this is followed by a brief summary of the results of an extensive series of numerical integrations of the equations of both the barotropic and thermotropic models. In all, a total of 120 24-hour forecasts were made every 12 hrs from a series of especially prepared maps throughout the entire month of Jan. 1953, the largest collection of numerical forecasts assembled to the present time. From a preliminary summary of the results supported by the discussion of several individual cases, it appears that the major characteristics of this series of numerical forecasts are: 1) the lack of a significant difference between the barotropic and thermotropic 500-mb forecasts, the correlation between the predicted and observed 24-hr 500-mb height changes being 0.74 in each case, 2) the marked effects of a number of purely mathematical errors or errors of method, especially those introduced by the lateral boundary conditions and by the use of the finite-difference approximation, and 3) an important effect of the Rocky Mountain barrier on the forecasts. These results are interpreted as demonstrating the quasi-barotropy of the atmosphere at midtropospheric levels when considered on a day-to-day basis over a monthly period. The 1000-mb forecasts computed from the baroclinic theory, while displaying an average correlation between predicted and observed 24-hr height changes of only 0.62, show considerable synoptic "skill," especially over the eastern United States. These forecasts are felt to demonstrate conclusively the applicability of

numerical prediction techniques to operational forecasting. Further research on the effects of both the physical and mathematical approximations of the methods of numerical prediction is suggested. (*Same item as 7.9-110, Sept. 1956, MAB.*) *Subject Heading: 1. Numerical forecasting. —Authors' abstract.*

8F-131

551.511:532.52:517.6

Thompson, Philip Duncan. *A theory of large-scale disturbances in non-geostrophic flow.* *Journal of Meteorology*, 13 (3):251-261, June 1956. 13 refs., 35 eqs. **DWB**—By a detailed analysis of the motions of a linear system, it has been found that the omission of the total derivative of the horizontal divergence from the divergence equation is necessary to exclude gravity-wave solutions. In effect, this modification diverts all of the transformed internal and potential energy into the wave energy of the large scale disturbances. In slightly stronger form, this type of modification is also sufficient to exclude gravity-wave solutions from the general nonlinear equations, and is essentially a generalization of the "filtering approximations" introduced by CHARNEY (1948). The scheme proposed for integrating the modified non-linear equations is an iterative method, whereby a conditionally convergent sequence of approximate solutions can be generated from a known initial distribution of pressure. This method is applied to the solution of a system of equations which is one order of approximation higher than the equations of quasi-geostrophic motion, and provides the basis for a practicable method of numerical forecasting. (*Same item as 7.10-147, Oct. 1956, MAB.*) *Subject Headings: 1. Hydrodynamic equations 2. Integration techniques 3. Numerical forecasting. —From author's abstract.*

8F-132

551.509.312

Thompson, Philip D., *A two-parameter nongeostrophic model suitable for routine numerical weather forecasting.* *U. S. Joint Numerical Weather Prediction Unit, Technical Memorandum*, No. 11, July 18, 1956. 14 p. 3 refs., fig., 20 eqs. **DWB**—A review of the equations for vertical distribution of vertical motion, the effect of quasi-geostrophic and nondivergent approximations on the average growth rate and an outline of a numerical method of solving the equations for a two-parameter nongeostrophic model to improve the 12, 24 and 36 hr numerical forecasts. It is found that some improvement in the 500 and 1000 mb height forecasts was evident, especially in the central portions of the grid. *Subject Headings: 1. Numerical forecasting methods 2. Nongeostrophic models.—M.R.*

8F-133

551.509.312:519.281.2

Thompson, Philip Duncan (*Joint Numerical Weather Prediction Unit, Wash., D. C.*), *Optimum smoothing of two-dimensional fields.* *Tellus*, Stockholm, 8 (3):384-393, Aug. 1956. 3 figs., refs., 10 eqs. **DLC**. Previously issued by U. S. Joint Numerical Weather Prediction Unit, April 26, 1955. 40 p. 3 figs., 2 refs., 11 eqs. **DWB**—The problem of smoothing out nonsystematic errors in a two-dimensional field of measurements has been studied from the standpoint of finding the type of weighted area average for which the RMS difference between the true field and the weighted average of the field of observations is the least. For fields whose space-autocorrelation functions are invariant with rotation and have a simple and rather typical form, the optimum weighting function is a linear combination of Bessel functions, whose rate of decrease away from the origin depends partially on the so-called "signal-to-noise" ratio, but primarily on the ratio of the scales of the true field and error field. A comparison of optimum averaging with the analyst's subjective process of smoothing indicates that the former is significantly superior in its ability to distinguish between random small-scale fluctuations and minor synoptic features of only slightly greater scale. Finally, the minimum RMS error of linearly smoothed fields is expressed in terms of the statistical properties of the true fields and the observing system itself. (*Same item as 7.11-142, Nov. 1956, MAB.*) *Subject Headings: 1. Two-dimensional smoothing 2. Numerical forecasting.—Author's abstract.*

8F-134

551.509.312

Thompson, Philip Duncan, *Uncertainty of initial state as a factor in the predictability of large scale atmospheric flow patterns.* *U. S. Joint Numerical Weather Prediction Unit, Washington, D. C.*, Dec. 26, 1956. 46 p. 3 figs., refs., 19 eqs. **DWB**—The predictability of atmospheric phenomena is analyzed theoretically with particular attention to prediction by means of a model similar to the "quasi-nondivergent" model proposed by Kuo (1956). The joint effect of factors of error is expressed in an equation which relates the increase in time of "inherent error" to the statistical properties of the initial error field and true initial flow pattern. Theoretical, practical and administrative problems dependent on the problem of predictability are discussed. *Subject Headings: 1. Numerical forecasting 2. Forecast errors.—G.T.*

8F-135

551.509.312

U. S. Air Weather Service, **Introduction to numerical weather prediction.** Its *AWS Technical Report* 105 120, Nov. 1954. 28 p. 2 figs., 15 refs., eqs. **DWB**—This report provides a systematic and lucid treatment of the general problem of numerical weather prediction starting in Pt. 1 with an outline of the purposes, then reviewing in Pt. 2 the history of the early attempts at weather prediction from the equations of motion, and Richardson's finite difference method using a grid of stations; and going on in Pt. 3 to the reawakening of interest in NWP during the 1940's. The basic sources of error which must be overcome (relative microscopic nature of important acceleration parameters compared with pressure gradients, and Coriolis Force which cannot be measured to 1% accuracy; and mathematical "bugs" or computational instability due to "sound wave" propagation arising from small random errors, and the necessity of using time differences of 1 hr rather than, say, 10 min). Simple method for prediction is worked out step by step and illustrated. In Pt. 4 the more recent developments in NWP made by AFCRC and CHARNEY and colleagues at Princeton (mainly introduction of 3-dimensional baroclinic flow formulas), an outline of the operational phase at the Joint NWP Unit begun in late 1954 and lastly, in Pt. 5, the future of NWP and its possible effect on conventional analysis and forecasting. A list of 15 references and an appendix giving the essential differences between linear and nonlinear equations, concludes the report. *Subject Headings:* 1. Numerical forecasting. I. Thompson, Philip D.—M.R.

8F-136

551.509.312

U. S. Joint GRD-AWS Numerical Prediction Project, **Report of progress for the period Feb. 1–Aug. 15, 1953.** Cambridge, Mass., Atmospheric Analysis Lab., Geophysics Research Directorate, Air Force Cambridge Research Center, Aug. 15, 1953. 47 p. Also: **Report . . . Aug. 15, 1953–Feb. 15, 1954**, issued Feb. 15, 1954. 49 p. Also: **Report . . . Feb. 15–Aug. 15, 1954**, issued Aug. 15, 1954. 48 p. Also: **Report . . . Aug. 15, 1954–Aug. 15, 1955**, issued Aug. 15, 1955. 18+p. figs., refs., eqs. **DWB**—The purpose of the project covered in these reports was: (1) to develop standardized procedures for routine production of numerical forecasts, (2) to test various methods for their usefulness, (3) to provide a basis for estimated requirements of an operational numerical prediction unit and (4) to train a group of future personnel. Theoretical, programming, testing, training and administrative operations performed in connection with these tasks from Feb. 1, 1953 to Aug. 15, 1955 are described in the main bodies of the four reports, comprising a total of some 90 pages. In addition to these accounts of activities and results, there are theoretical papers by staff members, attached to each report as appendices as follows. *In the first report:* Thompson, P. D., **The equations of "thermotropic flow"** (p. 30–40), in which equations are developed for a special type of baroclinic flow in which the distributions of temperature in any two isobaric surfaces are geometrically similar. (2) Thompson, P. D., **A variant of Green's method for solving the equations of barotropic and simple baroclinic flows** (p. 41–47), whose stated purpose is "to develop a numerical (or graphical) method for solving the prognostic equations, that does not require the calculation of finite-differences of order higher than the first." *In the second report:* (1) Berkofsky, Louis, **Equivalent baroclinic flow with arbitrary wind shear variation** (p. 14–19), in which the author extends THOMPSON's equivalent-baroclinic model by introducing terms accounting for variations of wind shear with height. (2) Aubert, Eugene J., **Multi-level baroclinic model for numerical forecasting** (p. 20–29) (for abstract, see 8F-6). (3) Pocinki, Leon, **The stability of large-scale disturbances in a baroclinic flow with horizontal shear** (p. 30–43), in which it is shown by an elaborate mathematical analysis that the stability of large-scale motions depends primarily upon the atmosphere's baroclinicity. (4) Gates, W. Lawrence, **Preparation of the equations of the thermotropic model for solution** (p. 44–49). *In the third report:* Pazniokas, J. J. and Gates, W. L., **A preliminary numerical investigation on the effects of boundary conditions, variability of coefficients, and vorticity grid size used with the thermotropic equations** (p. 29–35). (2) Thompson, P. D., **The vertical coupling of quasi-geostrophic motions** (p. 36–48), an attempt to determine (by evaluating the information value of data at various heights) the number of levels needed for adequate representation by finite-difference models, and preferred location of such levels. *In the fourth report:* (1) Berkofsky, L., **A three-parameter baroclinic numerical prediction model** (for abstract, see 8F-10). (2) Stern, Melvin E., **Theory of air flow over zonally heated oceans or continents** (26 p.). (3) Gates, W. L., **Note on convergence error in the relaxation method** (7 p.). (4) Pocinki, Leon S., **Comparison of objective no-skill forecasts with numerical forecasts** (14 p.); numerical forecasts are found to yield better results than no-skill forecasts in the center of the forecast area, but there is no marked superiority of either method near the boundaries. (5) Berkofsky, L., **Forecast height changes at various levels computed from the thermotropic model** (10 p.). Height changes for the 900, 700, 400 and 200 mb levels were computed from those predicted for the 1000 and 500 mb levels by the thermotropic model. Prognostic and actual charts are presented and correlation coefficients between forecast and observed height changes tabulated and discussed. (Also pub. in A.M.S., Bull., see 8.3-93, MAB.) (6) Courtney, Francis E., Jr., **The relationship between machine integrated average vertical motions and other meteorological parameters** (14 p.), in which mechanical computation of

verage vertical motion is reported and the usefulness of such information especially in precipitation forecasting is demonstrated. *Subject Headings:* 1. Numerical forecasting 2. Thermotropic models.—G.T.

8F-137

551.509.312:681.14

†U. S. Office of Naval Operations, **Numerical weather prediction.** Its *NAVAER* 50-1P-541, June 1956. 143 p. + appendices. numerous figs., 44 refs., numerous eqs. DWB—Experience accumulated by the Joint Numerical Weather Prediction Unit, Suitland, Md., is reported, covering very aspect of the Unit's operations. The organization of the Unit and its three sections (Development, Computation, Analysis), the components of the IBM Type 701 high-speed electronic computer and auxiliary machinery used by the unit and problems of programming and of data processing are discussed in detail. The theoretical models used, especially thermotropic and baroclinic models are described in a complete mathematical treatment. Progress achieved in forecasting precipitation, hurricanes, minimum flight path and swell is mentioned. Appended are: a paper by W. BUCHHOLZ (see 8F-21), verification scores of JNWP forecasts, and comments on the statistical method of WHITE and PALSON as a possible approach to numerical forecasting. *Subject Headings:* 1. Numerical forecasting 2. U. S. Joint Numerical Weather Prediction Unit 3. Electronic computers. I. Buchholz, Werner II. Stickles, Albert L. III. Moreland, Milton B. IV. Hubert, William E. V. Jones, G. Stephen VI. Hertzberg, Martin VII. Herman, Stanley.—G.T.

8F-138

551.511:551.513.1

Veselá, Dagmar and Vitek, Vojtěch (*Prague Univ.*), **Příspěvek k fyzikální interpretaci Eliassenova modelu.** [A contribution to the physical interpretation of Eliassen's model.] *Meteorologické Zprávy*, Prague, 9(3):78-81, June 1956. fig., 2 refs., 20 eqs. Russian and English summaries p. 78. DWB—A general relation for equivalent baroclinic levels using Eliassen's model is derived. The resulting equation determines equivalent baroclinic levels by means of quantities characteristic of the actual synoptic situation. *Subject Heading:* 1. Baroclinic models.—From authors' abstract.

8F-139

551.509.312:551.567

Vitek, Vojtěch (*Prague Univ., Met. and Clim. Inst.*), **Příspěvek k numerické prognose absolutní topografie 1000 mb.** [Contribution to numerical forecasting of the 1000 mb absolute topography.] *Meteorologické Zprávy*, Prague, 8(1):16-17, Feb. 28, 1955. 2 refs., 12 eqs. Russian and English summaries p. 16. DWB—An equation is derived which permits the numerical prediction of 1000 mb surface. This equation is a combination of the vorticity equation with the tendency equation for the 1000 mb level, assuming geostrophic flow and linear dependence of isobaric divergence on pressure. *Subject Headings:* 1. Numerical forecasting 2. Geostrophic approximation.—Author's abstract.

8F-140

551.511:551.513.1:551.509.311

Vitek, Vojtěch, **Některé vlastnosti barotropního modelu atmosféry.** [Some properties of the barotropic model of the atmosphere.] *Meteorologické Zprávy*, Prague, 9(2):25-32, 1956. 35 eqs. Russian and English summaries p. 25. DWB—The barotropic model is studied from two points of view: from the hydrodynamic aspect and from the aspect of numerical prediction. In the first place an arbitrary horizontal frictionless flow is studied and a new method of analysis is given. The resulting equation (3) is valid under the assumption that the absolute vorticity is different from zero. The individual terms of this equation are called the pseudogeostrophic, pseudokinetic, antistationary and pseudoconvective. An equation for ageostrophic vorticity is further derived and discussed. The complete equations characterizing an arbitrary horizontal flow are then applied to the horizontal nondivergent flow and it is shown that the horizontal nondivergent flow has some simple qualities. A necessary and sufficient condition is derived for the coincidence of an isobaric surface with the level of nondivergence and this condition is formulated in two different ways. In deriving this condition it is assumed that the Coriolis parameter has a constant value. It is shown that the ageostrophic flow in the level of nondivergence is steady and a new function (the barotropic potential) is introduced which enables the construction of ageostrophic streamlines. A simple relation between the relative vorticity and the deformation of the nondivergent flow is derived and the significance of the negative absolute vorticity is briefly discussed. For the purpose of numerical prediction of the 500 mb level the vorticity equation can be used in its complete form. The resulting equation (33) can be taken for a generalization of the barotropic vorticity equation. As the equation (33) has a baroclinic character, the nondivergent flow in the model used cannot determine its own development. The solution of the equation (33) depends on the solution of the prognostic equation (35) which describes the vorticity changes at the 1000 mb level. The application of equations (33) and (35) makes it possible to pass from the barotropic model to the baroclinic one. (Same item as 3-154, March 1957, M.A.B.) *Subject Headings:* 1. Barotropic models 2. Numerical forecasting.—Author's abstract.

8F-141

551.509.312

Watanabe, Tsugio, **On the horizontal divergence of the integrated atmosphere.** *Journal of Meteorological Research*, Tokyo, 6(7):214-220, Sept. 1954. 4 figs., table, 8 refs., 10 eqs. In Japanese; English summary p. 214. DWB—Assuming that the integrated wind component along the vertical is U, V , and that the surface pressure is p_0 , the tendency equation of the surface pressure is

$$\frac{\partial p_0}{\partial t} + \frac{\partial (p_0 U)}{\partial x} + \frac{\partial (p_0 V)}{\partial y} = 0.$$

Then the horizontal divergence of the stationary integrated atmosphere is given by

$$\frac{\partial U}{\partial x} + \frac{\partial V}{\partial y} = -\frac{1}{p_0} \left(U \frac{\partial p_0}{\partial x} + V \frac{\partial p_0}{\partial y} \right).$$

An integrated atmosphere map of the winter season of the North American area was constructed by making use of the monthly mean charts of 850 mb, 700 mb, 500 mb, and 300 mb isobaric surface, and the horizontal divergence chart was obtained. The principal results are as follows: (1) The western part of the continent is the convergence area, and the eastern part of the continent is the divergence area, the order of divergence or convergence being 10^{-7} sec^{-1} ; (2) The estimated distribution of the divergence in winter season at the 500 mb level after B. BOLIN and J. CHARNEY corresponds well with the author's result and this fact is important for numerical forecasting and (3) An application to numerical forecasting of surface pressure is discussed. (Same item as 6.11-150, Nov. 1955, MAB.) **Subject Headings:** 1. Numerical forecasting 2. Horizontal divergence.—*Author's abstract.*

8F-142

551.511.32:551.509.312

Welander, P., **On the dispersion of conservative properties in an ideal fluid and its consequences with regard to numerical forecasting.** (Summary.) *I.U.G.G. Association of Meteorology, Rome, Sept. 1956, Scientific Proceedings*. London, Butterworth, 1956. p. 503. DWB—A summary of a paper dealing with the application of a theory of a hydrodynamic dispersion system to 2- and 3-dimensional flows, and the introduction of the concept of hydrodynamic entropy, and the consequences of this for numerical forecasting. **Subject Headings:** 1. Hydrodynamics 2. Numerical forecasting.—*I.L.D.*

8F-143

551.509.312

White, Robert M. and Palson, William C., Jr., **On the forecasting possibilities of empirical influence functions.** *Journal of Meteorology*, 12(5):478-485, Oct. 1955. 4 figs., 4 tables, 6 refs., 17 eqs. DWB—The possibilities of using empirical functions derived from a 45-point grid (levels of 1000, 500 and 200 mb surfaces at 15 stations irregularly spaced over N. America) are explored. A series of 125 independent forecasts of deviations of levels from normal 1, 3 and 5 days ahead gave correlations with observed values: 1000 mb, 0.76, 0.56, 0.52; 500 mb, 0.83, 0.63, 0.57; 200 mb, 0.83, 0.66, 0.59. The method appears to be adequate for 24 hr forecasts, but for longer forecasts it may be necessary to develop more complex systems. (Same item as 7.3 129, March 1956, MAB.) **Subject Headings:** 1. Numerical forecasting 2. Empirical influence functions.—*C.E.P.B.*

8F-144

551.509.312:551.547.3:519.241.

White, Robert M., **Pressure-height predictability as a function of the type and amount of initial data.** *Journal of Meteorology*, 13(1):40-45, Feb. 1956. fig., 7 tables, 2 refs., 8 eqs. DWB—Multiple regression equations for prediction of 1000, 500 and 200 mb heights, using various combinations of these at 8 stations in the U. S., were found by electronic computing. The inclusion of 1000 mb and 200 mb data gave a significant increase of predictability over 500 mb data alone. (Same item as 7.8-95, Aug. 1956, MAB.) **Subject Headings:** 1. Numerical forecasting 2. Height tendency computation 3. Regression equations.—*C.E.P.B.*

8F-145

551.509.312:551.509.33

White, Robert M. (*Air Force Cambridge Research Center, Hanscom Field, Bedford, Mass.*), **The outlook for long-range weather forecasting.** *New York Academy of Sciences, Transactions*, 18(4):367-370, Feb. 1956. 3 refs. DLC—It is pointed out that recent studies on the dynamics of the general circulation, which indicate a feed back relationship between the planetary circulation and secondary disturbances, combined with the technique of numerical weather prediction could serve as a basis for more successful long range weather predictions. The author then discusses in general terms the application of physical circulation models and the difficulties in the application of numerical techniques to long range forecasting, and the role of statistical analysis in long range forecasting. **Subject Heading:** 1. Numerical long range forecasting.—*I.L.D.*

8F-146

551.5:519.2(02)

Whittaker, Sir Edmund Taylor and Robinson, G., *Calculus of observations: a treatise on numerical mathematics*. 4th ed. London, Blackie, 1944 (reprinted 1952). 397 p. numerous foot-refs. and eqs. DWB—Mathematics for astronomers, meteorologists, physicists, engineers and statisticians, based on 10 years of lectures by WHITTAKER (1913–23) at Edinburgh Univ. Mathematical Laboratory. Revised and reprinted many times. Chapters on interpolation difference formulae, determinants, calculus of observations, numerical integration and summation, frequency distribution method of least squares, Fourier analysis, smoothing, correlation, periodicities. Many practical examples are worked out, and useful tables included for calculation. *Subject Headings*: 1. Mathematics for meteorologists 2. Statistics in meteorology 3. Mathematics textbooks.—M.R.

8F-147

551.509.312

Wilson, H. P., *Test of a grid method of forecasting the motions of lows at 500 millibars in Arctic regions*. Canada. *Meteorological Div., Cir-2539 TEC-194*, Oct. 4, 1954. 8 p. figs., 3 tables, 2 refs. DWB—RIEHL's grid method for forecasting the 24-hr motions of hurricanes which is "essentially a method for measuring mean zonal and meridional geostrophic wind components over an area around the hurricane roughly around 1000 mi square" was modified into a square grid so that "the gradients measured are parallel to the great circles at right angles to each through the center of the low and not strictly zonal or meridional components." It was applied to the Arctic, where air masses are predominantly barotropic, and tested with 500 mb charts of the Historical Weather Map series or Jan.–Sept. 1951. The method developed for the Arctic is described and the assumptions and errors are discussed. This grid method was found to give satisfactory forecasts about two-thirds of the time. (Same item as 6.11–152, Nov. 1955, MAB.) *Subject Headings*: 1. Numerical forecasting 2. Forecasting techniques 3. Forecasting cold lows 4. Arctic weather forecasting.—I.L.D.

8F-148

551.509.312

Wippermann, F., *Zur Frage der Anwendung numerischer Prognosenmethoden auf zeitlich gemittelte Felder*. [On the application of numerical forecasting methods to fields averaged over time.] *Meteorologische Rundschau*, 7(7/8):123–124, July/Aug. 1954. 6 figs., 4 refs., 6 eqs. English summary p. 123. DWB—By applying numerical calculation to fields averaged over time or space a smoothed time development can be found, but it is necessary to take account of the divergence of the macroturbulent field. The method is set out with the example of the 10-day Northern Hemisphere 500 mb chart for April 11–20, 1953. By calculating the change to April 14–23, a 3-day forecast was obtained which had a correlation of 0.5 with the observed development. (Same item as 6.1–89, Jan. 1955, MAB.) *Subject Heading*: 1. Numerical forecasting.—C.E.P.B.

8F-149

551.509.312

Wippermann, F., *Über das Verhalten des Truncationsfehlers bei Verwendung der zweidimensionalen und divergenzfreien Vorticity-Differenzengleichung*. [On the truncation error in the application of the two-dimensional nondivergent vorticity difference equation.] *Meteorologische Rundschau*, 8(3/4):44–48, March/April 1955. fig., 4 tables, 6 refs., 36 eqs. DWB—(For English version see 8F-46.) For the linearized as for the non-linear two-dimensional divergence-free vorticity equation in difference form, in certain circumstances the solution and criteria for stable error convergence are given. By comparison of these solutions with those for the corresponding differential equations it is seen that in the region of stable error convergence the truncation error only changes the phase velocity of the waves. This is increased by the error of truncation in time, decreased by truncation in space. Thus for every space mesh Δx an optimal time step Δt can be found, for which these two effects cancel and the truncation error vanishes. When the instability threshold is reached the phase velocity remains constant but the amplitude begins to grow. An example makes this clear. (Same item as 6.10–100, Oct. 1955, MAB.) *Subject Headings*: 1. Numerical forecasting 2. Truncation errors.—Trans. of author's abstract.

8F-150

551.551:551.511:533.7

Wippermann, F. (*Deutscher Wetterdienst, Frankfurt/M.*), *Numerical investigations of temporal change of spectral distribution of kinetic energy in a twodimensional non-divergent and frictionless current*. Germany. Deutscher Wetterdienst, Contract AF 61(514)-735-C, Technical Note No. 3, [1956?]. 20 p. 9 figs., table, 7 refs., 12 eqs.—Stepwise integration of the vorticity equation for barotropic flow permits the computation of spectral distribution of kinetic energy for specific points of time. Investigated is the question of a special quasistationary spectral distribution; hereby occurs, after some 4 days for several arbitrary selected initial spectral distributions the shape of a double maximum as observed in the atmosphere. From the energy tendency computations, averaged over all wave lengths and represented as function of time, it can also be concluded that the spectral distribution observed in the atmosphere corresponds to a quasistationary one. The occurrence of

oscillations in the transfer of energy between basic current and the oscillations is established. The period of such oscillations is approximately $3\frac{1}{2}$ -4 days in middle latitudes and mainly depends on the angular velocity of the earth. The state of balance of horizontal currents with respect to the existence of such oscillations is considered. The advantages and disadvantages of the integration process by means of Fourier's coefficients are discussed. (*Same item as 8.5-194, May 1957, MAB.*) *Subject Headings: 1. Turbulence spectrum 2. Kinetic energy in atmosphere.—Author's abstract.*

SUPPLEMENTARY MATERIAL

See also: Spectrum modification due to use of finite differences (Ogura), 8.6-196 [this issue] and Wave solutions of the vorticity equation for the $2\frac{1}{2}$ dimensional model (Ogura), 8.6-197.

8F-151

551.513.13:551.509.31

§Angervo, J. M., *Zur Theorie der Zyklonen- und Antizyklonenbahn.* [Contribution to the theory of cyclone and anticyclone tracks.] *Beiträge zur Geophysik*, 33 (Köppen Band II):45-59, 1931. 5 figs., 6 charts, 7 refs., eqs. **DLC**—The simplified iterative formulas presented here, were derived from the author's earlier equations for numerical prediction of movement of cyclone tracks, and were found to give good agreement with actual tracks over Scandinavia and Central Europe during June 1931. This method might be adapted to numerical prediction of tropical cyclone tracks. (*Same item as 7K-29, Nov. 1956, MAB.*) *Subject Headings: 1. Cyclone track forecasting 2. Numerical forecasting.—W.N.*

8F-152

551.509.312

†Eliassen, A. and Kleinschmidt, E., Jr., *Dynamic meteorology.* *Handbuch der Physik*, Berlin, 48:1-154, 1957. 41 figs., numerous refs., numerous eqs. **DWB**—In this text on the dynamics of the atmosphere, basic theories of physical hydrodynamics and their application to various modes of atmospheric motion are reviewed in a thorough mathematical treatment. Numerical forecasting, based on the use of simplified atmospheric models, is discussed. Mechanisms of cyclones and anticyclones and of the general circulation are explained and shown in diagrams and sample charts. *Subject Heading: 1. Numerical forecasting.—G.T.*

8F-153

551.509.312:551.515.2

Hubert, Lester F., *Error analysis of prognostic 500-mb maps made for numerical weather prediction of hurricane motion.* *U. S. Weather Bureau. National Hurricane Research Project, Report*, No. 2; Supplement. March 1957. 20 p. 21 figs., 3 tables, foot-refs., eqs. **DWB**—Height forecast errors in numerical methods using the thermotropic model are analyzed in 14 trial predictions involving 7 different hurricanes. The thermotropic model will produce more accurate forecasts than the barotropic model in respect of height, but not in respect of hurricane motion. (For Report No. 2, see 8F 61, June 1957, *MAB.*) *Subject Headings: 1. Numerical hurricane forecasting 2. Thermotropic models.—G.T.*

8F-154

551.509.312

Knighting, E.; Jones, D. E. and Hinds, Mavis K., *Numerical experiments in the integration of the meteorological equations of motion.* *Great Britain. Meteorological Research Committee, M.R.P.*, 1018, 7th Dec., 1956. 26 p. 7 figs., 16 tables, 12 eqs. Mimeo. **DWB**—Equations relating changes of vertical component of vorticity to advection and divergence, which form the basis of all practical methods of numerical weather prediction, can only be integrated by finite difference methods. The values of the vorticities and Jacobians were calculated for 500 mb surface over a mesh of 18×14 points with a grid length of about 160 mi, for 18 cases. Two sets of 24 hr forecasts were made by the same method, but with different orientations and sizes of the mesh. There were large differences amounting to 10-40%, in the calculated height tendencies. *Subject Heading: 1. Numerical forecasting techniques.—C.E.P.B.*

8F-155

551.509.312:551.511

Masuda, Y., *On a graphical integration of the barotropic vorticity equation and its application to the numerical weather forecast.* *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 33(6): 280-290, Dec. 1955. 17 figs., 2 tables, 6 refs., 29 eqs. In Japanese; English summary p. 280. **DWB, DLC**—FjØRTOFT's graphical method of integrating the barotropic vorticity equation is developed under some approximate assumptions, and eliminating the relaxation procedure of FjØRTOFT's approximate integration formulas for solving the Poisson type equation. By taking account of changes in FjØRTOFT's "quasi-permanent velocity field" the accuracy of forecasts is

improved and their range is extended. Prognostic charts for 12, 24 and 48 hrs ahead are presented. *Subject Headings:* 1. Fjörtoft's graphical method 2. Numerical forecasting 3. Vorticity equations. —*Author's abstract.*

8F-156

551.515.23:551.509

Riehl, Herbert and Haggard, W. H. (*both, Dept. of Met., Chicago Univ.*) **Quantitative method for the prediction of tropical storm motion.** (In: UNESCO Symposium on Typhoons, Tokyo, Nov. 9-12, 1954, *Proceedings*, pub. 1955. p. 247-248.) **DWB**—The motion of tropical storms takes place mainly under the influence of the tropospheric air currents surrounding them. An attempt was made to determine this "steering current" numerically from 500 mb charts and to calculate regression formulas between the instantaneous upper flow and the subsequent 24-hr path of tropical storms. A margin of error within 60 mi of the correct final position was obtained in 85% of a sample of 35 Atlantic hurricanes with a revised set of regression equations. There were still too many failures to consider the technique as final. But it is to be noted that one cannot say with certainty whether the failures are due to the method or to shortcomings of observations and analyses of the charts utilized. (*Same item as 7I 170*, Sept. 1956, *MAB.*) *Subject Headings:* 1. Forecasting tropical storm movement 2. Steering current.—*Authors' abstract.*

8F-157

551.509.312

Rosby, Carl-Gustav, **Stockholm Seminar Project.** Chicago. Univ. and Stockholm. University, Contract Nonr-613-(00), Subcontract No. 1, Final Report, Oct. 1, 1951-March 31, 1953, pub. March 1954. 6 p. 10 refs. **DWB**—History of Stockholm Seminar Project which was transferred as a subcontract from the Univ. of Chicago during 1951 and completed in 1953 when the subcontract was transferred to the Woods Hole Oceanographic Institution. Most of the scientific and developmental work done under this project, as is shown by the enumeration of accomplishments, had to do with the numerical prediction of isobaric or wind patterns. Lectures were attended by about 60 from U. S. and Europe. Lecture notes were made available. (*Same item as 6.7-78*, July 1955, *MAB.*) *Subject Headings:* 1. Stockholm Seminar Project 2. Numerical forecasting research.—*M.R.*

8F-158

551.509.312

Sasaki, Y., **A fundamental study of the numerical prediction based on the variational principle.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 33(6):262-275, Dec. 1955. 10 figs., 9 refs., eqs. Reprinted in: *Collected Meteorological Papers*, Tokyo, 6(1/2), Dec. 1955. Contribution, No. 88. **DWB**—A graphical method of numerical prediction is developed. It is based on HAMILTON's canonical equations of the "meteorological field." The method eliminates small scale disturbances and is particularly suited for extended and long-range forecasting. Nomograms to be used in the computing operations are included. *Subject Heading:* 1. Numerical forecasting.—*G.T.*

8F-159

551.515.11:551.509.317:681.14

Sawyer, J. S., **Some aspects of mobile depressions in a baroclinic current studied by means of the two-parameter representation of the atmosphere.** (In: American Meteorological Society and Royal Meteorological Society, *Proceedings of the Toronto Meteorological Conference*, Sept. 9-15, 1953. pub. 1954. p. 145-153. 7 figs., 7 refs., 10 eqs.) **DWB**—The two-parameter model is applied to a small mobile depression in a baroclinic current (Eng., 14-15 March 1949) with good results. The 3-dimensional trajectories in an ideal depression are computed. It is concluded that the two-parameter model is satisfactory. The circulation includes air moving with the disturbance, air at low levels entering from ahead and leaving by the rear, and high level air entering from the rear and passing out ahead. The boundaries between these resemble fronts. (*Same item as 6.3-117*, March 1955, *MAB.*) *Subject Headings:* 1. Cyclone dynamics 2. Upper air analysis 3. Numerical forecasting.—*C.E.P.B.*

8F-160

551.509.312

Sellers, William David, **Statistical-dynamic approach to numerical weather prediction.** Massachusetts Institute of Technology. Dept. of Meteorology, Contract AF 19(604)-1566, Scientific Report, No. 2, June 1957. 151 p. 10 figs., 7 tables, 55 refs., 96 eqs.—A numerical weather prediction method is developed which combines the statistical with the dynamic approach. The 500 mb height anomaly field (Jan., United States and southern Canada), as represented on a grid of 64 points, is approximated by a linear combination of nine fixed empirical space functions. Values from this approximation are introduced into the barotropic vorticity model, using a system of nine quadratic equations rather than 64 finite difference equations like in the usual dynamic forecasting method. Results of the application of this technique to daily 24-hr forecasts of 500 mb height anomaly fields (Jan. 2-Feb. 1, 1953) are presented. A comparison of these results with those obtained by the GRD Numerical Prediction Project with a standard barotropic model shows the

latter to be superior. Nevertheless, the statistical method is considered promising and considerable improvement is expected from the introduction of further refinements. *Subject Headings: 1. Statistical forecasting 2. Numerical forecasting.—G.T.*

8F-161

551.513.1

Silberman, Isadore, **Planetary waves in the atmosphere.** *Journal of Meteorology*, 11(1):27-34, Feb. 1954. 5 figs., 18 refs., 21 eqs. **MH-BH**—A method is presented for solving the nonlinear barotropic vorticity equation directly by expressing it as a harmonic tendency equation and evaluating a number of constants. These equations may be used to forecast the future flow pattern by an iterative process. The planetary waves are regarded as perturbations superposed on a steady zonal flow in which angular velocity varies with colatitude. The calculations are illustrated by the 500 mb situation on Dec. 4-5, 1950. The neglect of harmonics of large degree is justified by the damping effect of large scale lateral mixing. (*Same item as 5.9-133, Sept. 1954, MAB.*) *Subject Headings: 1. Planetary circulation 2. Barotropic models.—C.E.P.B.*

8F-162

551.509.1:551.509.312

Smebye, S., **Einige Tendenzberechnungen mit einem sogenannten $2\frac{1}{2}$ dimensionalen Modell.** [Some tendency calculation with a so-called $2\frac{1}{2}$ dimensional model.] *Berlin. Freie Universität. Institut für Meteorologie und Geophysik, Meteorologische Abhandlungen*, 2(3):199-208, 1954. 6 figs., 2 refs., eq. **DWB**—The author describes a model of the temperature field in which vertical temperature distribution is expressed by the relative topography. The height of the 500 mb surface and relative topography 500/1000 mb are independent variables and the 500 mb and 1000 mb tendencies are calculated by means of the forecasting equations $\Delta Z + C\Delta h_t + DJ_1 + EJ_2 + G(H_t + J_3)Dh = 0$ and $\Delta h_t + Hh_t + HJ_3 + KJ_1 + KJ_2 = 0$ when D, E, G, H and K are constants depending upon $A(p)$, which determines the vertical wind and temperature distribution, t —differentiation for time, J_3 —transport, y —the relative topography h , J_1 and J_2 —vorticity transport in ten isobaric surfaces dependent upon $A(p)$. The application of the model is illustrated. (*Same item as 7.8-83, Aug. 1956, MAB.*) *Subject Headings: 1. Barometric tendency calculation 2. Relative topography 3. Vertical temperature distribution.—I.L.D.*

8F-163

551.509.312:551.515.2

Terauchi, E.; Nabeshima, Y.; Suzuki, T. et al., **Numerical prediction of typhoon tracks, Pt. 1.** *Journal of Meteorological Research*, Tokyo, 9(3):167-175, March 1957. 14 figs., 3 tables, 63 eqs. In Japanese; English summary p. 167. **DWB, DLC**—Numerical forecasts of typhoon tracks prepared with the SAKAKI-MIYAKODA barotropic model (in 1954 and 1955) and with a baroclinic model (in 1956) are reported. The mathematics of the baroclinic model adapted to typhoon forecasting are treated in detail. Charts showing predicted and observed typhoon tracks are presented. *Subject Headings: 1. Numerical typhoon forecasting. I. Itami, T. II. Sagisaka, T. III. Sato, T.—G.T.*

8F-164

551.509.312

Thompson, Philip Duncan, **Numerical prediction: an exposition and review for the nonspecialist.** Wash., D. C., Joint Numerical Weather Prediction Unit, April 18, 1957. 16 p. 2 figs. **DWB**—The general hydrodynamical equations and the idealized models derived from them are discussed in a lucid manner. Operations of the Joint Numerical Weather Prediction Unit are described with particular emphasis on the automatic data-processing system recently developed by the unit. Under this system "data are fed directly from teletype to computing machine, and there edited, processed and analyzed automatically virtually untouched by human hand." *Subject Headings: 1. Numerical forecasting 2. U. S. Joint Numerical Weather Prediction Unit.—G.T.*

8F-165

551.509.312

Pfeffer, R. (U. S. Air Force Cambridge Res. Center) and Phillips, Norman (Dept. of Met., M.I.T.), **Numerical weather prediction.** *Applied Mechanics Reviews*, N. Y., 10(7):279-282, July 1957. 58 refs., eq. **DLC**—Recent progress in, and the present status of, statistical and dynamical forecasting by the use of electronic computers, is systematically and concisely reviewed in this article. Emphasis is placed on the dynamical methods with which the writers are most familiar. The basic equations, sources of errors or difficulty (paucity of data, too much smoothing or neglecting of important factors, computational distortions arising from the effect of high speed sound or gravity waves, nonadiabatic or frictional influences, and boundary-induced errors); relative success with the barotropic, and the 2-level models; attempts at improvement by considering heat sources or topography, or by the use of stream functions instead of pressure fields; the problem of longer-range forecasts and, finally, the use of electronic computers or numerical methods to explain the general circulation, are treated. The list of references provides a very good bibliography to recent literature on this subject. *Subject Headings: 1. Numerical forecasting progress 2. Numerical forecasting bibliographies.—M.R.*

PART III. REVIEWS, TRANSLATIONS, REPRINTS, ROUTINE PUBLICATIONS, AND ANALYTICS FROM RECENT SERIALS AND COLLECTED WORKS

Note: Material listed in these sections will not be included in the monthly indexes until abstracted. The item number is mentioned for those titles which have been abstracted in previous issues of *Meteorological Abstracts and Bibliography*.

A. REVIEWS OF IMPORTANT METEOROLOGICAL MATERIAL

- Albrecht, H. J.: **New design aspects of boomerang radio sondes for upper air research.** (In) *Geofisica Pura e Applicata*, 33:121-145, 1956. 2 figs., 30 refs., 19 eqs. Review in *Rivista di Meteorologia Aeronautica*, Rome, 16(3):38, July/Sept. 1956.
- Arctic Research: the current status of research and some immediate problems in the North American Arctic and Subarctic.** (In) *Arctic*, Montreal, 7(3/4):117-375, 1954. figs., tables, bibliogs. Also reprinted as *Arctic Institute of North America, Special Publications*, No. 2, 1955. Review by R. J. Adie in *Journal of Glaciology*, London, 3(21):80, March 1957. Review by Andrew Taylor in *Geographical Review*, N. Y., 47(2):303-304, April 1957.
- Armstrong, Terence and Roberts, Brian: **Illustrated ice glossary.** (In) *Polar Record*, Cambridge, 8(52):4-12, 1956. Also issued by Scott Polar Research Institute as a reprint. Price, 5 sh. Review by Moira Dunbar in *Journal of Glaciology*, London, 3(21):81-82, March 1957.
- Bultot, Franz: **Étude statistique des pluies intenses en un point et sur une aire au Congo Belge et au Ruanda-Urundi** [Statistical study of intense rains at a point and over an area in Belgian Congo and Ruanda-Urundi]. *Institut National pour l'Étude Agronomique du Congo Belge. Bureau Climatologique, Communication*, No. 11, 1956. 90 p. 19 figs., tables, 19 refs., eqs. Review by G. A. Bull in *Nature*, London, 179(4552):190, Jan. 26, 1957. (For review on original, see 7.11-14, Nov. 1956, *MAB*.)
- Daniels, Farrington and Duffie, John A. (eds.): **Solar energy research.** Madison, Wisc., Univ. of Wisconsin Press, 1955. 290 p. 53 figs., 17 tables, bibliogs. for each chapter (272 refs.), eqs. Review by F. Steinhäuser in *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 8(1):132-133, 1957. (See 6.11-19, Nov. 1955, *MAB*.)
- Delfs, Jürgen: **Die Niederschlagszurückhaltung im Walde** [Rainfall retention in the forest]. *Wald und Wasser*, Koblenz, No. 2, 1955. Paging not given. Review by H. Schubert in *Zeitschrift für Meteorologie*, 10(9):287, Sept. 1956.
- Flora, Snowdon Dwight: **Hailstorms of the United States.** Norman, Okla., Univ. of Oklahoma Press, 1956. 201 p. illus. Price, \$3.50. Review by Stephen S. Visser in *Scientific Monthly*, Wash., D. C., 84(3):158, March 1957. (See 8.6-8, June 1957, *MAB*.)
- Garland, John Henry (ed.): **The North American Midwest: a regional geography.** N. Y., John Wiley; London, Chapman & Hall, 1955. 252 p. 80 figs., maps, bibliog. p. 243-245. Price, \$8.00. Review by Leslie Hewes in *Geographical Review*, N. Y., 57(1):145-146, Jan. 1957. Review by A. F. Martin in *Geographical Journal*, London, 123(1):98-99, March 1957.
- Gerson, Nathaniel C.: **The atmosphere.** U. S. Air Force. *Cambridge Research Center, Air Force Surveys in Geophysics*, No. 73, Sept. 1955. 62 p. 35 figs., 4 refs. Review by P. Graystone in *Meteorological Magazine*, London, 86(1015):27-28, Jan. 1957. (See 7.4-12, April 1956, *MAB*.)
- Gnam, G. and Wolf, F.: **Quantitatives zur Elektrizitätserzeugung durch den Wasserfalleffekt auf Eis** [Quantitative electric charges induced by water drops falling on ice]. (In) *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 9(2):232-241, 1956. 3 figs., 3 tables, 19 refs. English and French summaries, p. 232-233. Review in *Rivista di Meteorologia Aeronautica*, Rome, 16(3):56, July/Sept. 1956. (See 7.9-263, Sept. 1956, *MAB*.)
- Grant, A. M.: **The application of correlation and regression to forecasting.** Australia. *Bureau of Meteorology, Meteorological Study*, No. 7, 1956. 14 p. 3 tables, 16 refs., numerous eqs. Review in *Rivista di Meteorologia Aeronautica*, Rome, 16(3):40, July/Sept. 1956. (See 7.9-111, Sept. 1956, *MAB*.)

- Gunn, Ross: **Initial electrification processes in thunderstorms.** (In) *Journal of Meteorology*, 13(1): 21-29, Feb. 1956. 4 figs., 21 refs., 14 eqs. Review in *Rivista di Meteorologia Aeronautica*, Rome, 16(3):57, July/Sept. 1956. (See 7.8-266, Aug. 1956, MAB.)
- International Symposium on Man's Role in Changing the Face of the Earth, Princeton, N. J., June 16-22, 1955: **Man's role in changing the face of the earth.** Ed. by William L. Thomas, Jr. Pub. for the Wenner Gren Foundation for Anthropological Research and the National Science Foundation, by the Univ. of Chicago Press, 1956. 1193 p. figs., photos, maps, bibliog. at end of most ch. Review by F. H. W. Green in *Geographical Journal*, London, 123(1):111-112, March 1957.
- Jeffreys, Harold and Swirls, Bertha: **Methods of mathematical physics.** 3rd ed. Cambridge Univ. Press, 1956. 714 p. figs., tables. Price, 84 sh. Review in *Royal Meteorological Society, Quarterly Journal*, 82(354):545-546, Oct. 1956.
- Kern, Helmut and Völk, J.: **Das Hochwasser im bayerischen Donaugebiet im Juli 1954** [Flood water in the Bavarian Danube area in July 1954]. *Deutsches Gewässerkundliches Jahrbuch Besondere Mitteilungen*, No. 14, 1955. Review by — Schubert in *Zeitschrift für Meteorologie*, 10(5):160, May 1956.
- Knoch, K. and Shulze, A.: **Niederschlag, Temperatur und Schwüle in Afrika** [Rainfall, temperature and sultriness in Africa]. Hamburg, Falk-Verlag, 1956. German and English text. (With selection of charts from Vol. 2 of the Welt-Seuchen-Atlas). Price, DM 25. Review by F. Steinhauser in *Archiv für Meteorologie und Bioklimatologie, Ser. B*, 8(1):129-130, 1957.
- Kondrat'ev, K. Ia.: **Luchistaia energiia solntsa** [Radiant energy of the sun]. Ed. by P. N. Tverskoï. Leningrad, Gidromet. Izdat., 1954. 599 p. 267 figs., 220 tables, bibliog. p. 571-590. Review by H. Matzke in *Zeitschrift für Meteorologie*, 10(9):285, Sept. 1956. (See 8.5-8, May 1957, MAB.)
- Kubota, S.: **Numerical prediction by the quasi-double Fourier series.** (In) *Papers in Meteorology and Geophysics*, Tokyo, 5(2):144-152, 1954. Review in *Rivista di Meteorologia Aeronautica*, Rome, 16(3):41, July/Sept. 1956. (See 6.11-145, Nov. 1955, MAB.)
- Kuenen, P. H.: **Realms of water.** London, Cleaver-Hume; N. Y., John Wiley, 1955. 327 p. 16 plates, 190 figs. Price, 35 sh. Review by W. H. Ward in *Journal of Glaciology*, London, 2(20):771-772, Oct. 1956. Review by C. D. Ovey in *Royal Meteorological Society, Quarterly Journal*, 82(354):548, Oct. 1956. (See 7.10-4, Oct. 1956, MAB.)
- Logvinov, K. T.: **Dynamische Meteorologie** [Dynamic meteorology]. Berlin, Deutscher Verlag der Wissenschaften, 1955. 154 p. 43 illus., 6 tables, 28 refs. Review by M. Schlegel in *Meteorologische Rundschau*, Berlin, 9(7/8):152, Aug. 1956.
- Moore, Patrick: **Earth satellites.** N. Y., Norton, 1957. 157 p. illus. Price, \$2.95. Review by Homer E. Newell, Jr., in *Scientific Monthly*, Wash., D. C., 84(3):158-159, March 1957.

B. TRANSLATIONS AND ROUTINE DATA PUBLICATIONS

TRANSLATIONS

- Agureev, S. P.: **Opreделение izmenenii v tolshchine l'da s ego poverkhnosti** [Determining changes in the thickness of ice from its surface]. (In) *Meteorologiya i Gidrologiya*, Leningrad, No. 1:56, Jan. 1956. fig. English translation issued by Special Libraries Association, Translation Center, No. R-215, Feb. 1957. Available from John Crerar Library, 86 East Randolph Street, Chicago 1, Ill.
- Argentina. Servicio Meteorológico Nacional: **Resumen y analisis de observaciones de electricidad atmosférica (Pilar), 1924-1936** [Resume and analysis of observations of atmospheric electricity at Pilar Geophysical Observatory, 1924-1936]. Its (*Publicaciones*), Series B, Sec. 2, Pt. 3, No. 1, 1952. Also: **Resumen y analisis . . . 1937-1950.** *Ibid.*, No. 2, 1953. Mostly tables and graphs. Both translated into English and issued by American Meteorological Society under Contract AF 19(604)-1936. 7 p. (For abstracts on originals, see 5.1-306, Jan. 1954 and 6.4-336, April 1955, MAB, respectively.)
- Bugaev, V. A. and Chernysheva, O. N.: **[Thermobaric field of the troposphere above moving anticyclones].** (Original Russian in) *Akademiia Nauk Uzbekskoi SSR, Institut Matem. Mekhanik, Trudy*, No. 12:71-75, 1953. English trans. issued by Special Libraries Association, Translation Center, No. R-286, Feb. 1957. Available from John Crerar Library.
- Flohn, Hermann: **Zur Aerologie der Polargebiete** [Aerology of the Polar regions]. (In) *Meteorologische Rundschau*, 5(5/6 and 7/8):81-87, 121-128, May/June and July/Aug. 1952. 5 figs., 28 tables, 53 refs. Trans. into English issued by Special Libraries Association, Translation Center, No. 2417, April 1957. Available from John Crerar Library. (See 4.2-264, Feb. 1953, MAB.)

- usev, V. D. and Mirkotan, S. F.: [Investigation of the fine structure of the ionosphere by the method frequency-diversity reception]. (Original Russian in) *Radiotekhnika i Elektrotekhnika*, 1(6):743-746, 1956. Trans. into English issued by Special Libraries Association, Translation Center, No. R-286, Feb. 1957. Available from John Crerar Library.

REPRINTS

- Bradbury, Dorothy L.: Experiment in instability and moisture analyses. (In) Chicago. Univ. Dept. of Meteorology, Contract AF 19(604)-1293, Final Report, Feb. 1957, Sec. H (32 p.) 13 figs., 3 tables, 4 refs., eqs. (For abstract on this paper from another source, see 8.1-190, Jan. 1957, MAB.)
- Istoque, Mariano A.: Graphical integration of a two-level model. (In) Chicago. Univ. Dept. of Meteorology, Contract AF19(604)-1293, Final Report, Feb. 1957, Sec. D (24 p.). 5 figs., table, 2 refs., 11 eqs. (See 8.4-130, April 1957, MAB.)
- Ikita, Toshiichi and Kimura, Kozo: Ice crystal growth in the atmosphere. (In) *Committee for Rain-Making in Japan, Tokyo, Report of Rain-Making in Japan, 1:55-67, 1954.* 2 tables, 12 fig., 10 ref. (See 6J-256, Oct. 1955, MAB.)
- Libet, Jean: Bilan calorifique de l'énergie effectivement versée par le rayonnement solaire direct en un lieu donné [Thermal energy balance of direct solar radiation received at a given place]. *Lyons. Observatoire, Publications, Ser. 2, Météorologie et Physique du Globe*, 1(9), 1954(?). 3 figs., 2 refs. (See 6.5-142, May 1955, MAB.)
- Group, A. J.: An aerological study of the "meridional front" in Western Australia. Reprinted for the Commonwealth Bureau of Meteorology, Melbourne, from *Australian Meteorological Magazine*, No. 14:1-22, Sept. 1956. tables, figs.

ROUTINE PUBLICATIONS

- Federación Nacional de Cafeteros de Colombia, Bogotá: *Anuario Meteorológico* [Meteorological annual], Vol. 1-2, 1954. pub. 1955? 308 p. entirely tables. (For abstract on 1952 issues, see 7.2-80, Feb. 1956, MAB.)
- Finland. Ilmatieteellinen Keskuslaitos: Sade- ja Lumihavaintoja Suomesta [Precipitation and snow observations in Finland], 1944, issued Helsinki, 1955. 71 p. almost entirely tables. Its *Suomen Meteorologinen Vuosikirja*, Vol. 44, Pt. 2, 1944. (For 1951 issue see 4.5-166, May 1953, MAB.)
- France. Météorologie Nationale: *Bulletin Annuel du Service Météorologique de la Métropole et de l'Afrique du Nord, 1952, 2ème Partie, Tableaux Climatologiques* [Annual bulletin of the Meteorological Service of France and of North Africa, 1952, Pt. 2, Climatological tables]. issued Paris, 1957. 797 p. map (colored, fold.). almost entirely tables. loose-leaf. (For Pt. 1-2 for 1949 issue, see 8.4-97, April 1957, MAB.)
- Germany. Deutscher Wetterdienst: *Agrarmeteorologische Bibliographie* [Agricultural meteorology bibliography], 1953, 1954 and 1955. Its *Bibliographien*, No. 5, 6, and 7, issued 1956, 1957 and 1957. about 80 p. each. (For 1951 and 1952 issues, see 7.11-58, Nov. 1956, MAB.)

C. METEOROLOGICAL ARTICLES APPEARING
IN RECENTLY ISSUED PUBLICATIONS*Acta Geophysica Polonica*, Warsaw, Vol. 5, No. 1, 1957

- Wieladek, Romuald and Wojtczak, Bożena: Application of the generalized adjustment method in the determination of coordinates of the seismic focus on the basis of several different phases, p. 3-10
- Kopcewicz, Teodor: Le rapport entre la répartition de la température de l'air et la vitesse dans le tourbillon circulaire, stationnaire, horizontal, [Relation between the distribution of atmospheric temperature and the velocity of a circular, stationary and horizontal vortex], p. 11-21
- Przybyszewski, Eugeniusz: Comparison of La Cour magnetometers at the Geophysical Observatory on the Hel Peninsula, p. 22-33
- Pokrzywnicki, Jerzy: On the Ostrzeszow bolide and the search for the meteorite which fell from it, p. 34-46
- Gryglewicz, Zofia and Skoczek, Hanna: Aktywność sejsmiczna w 1955 r. [Seismic activity in 1955], p. 47-58

Acta Meteorologica Sinica, Peking, Vol. 26, No. 1/2, 1955

- Tschu, Kang-Kun and Yang, Jen-Chang: A study of the evaporation distribution in China, p. 1-23
- Hwang, S. S.: Basic factors determining the main features of the general circulation of the atmosphere, p. 35-64
- Koo, Chen Chao: Opredelenie estestvennogo sinopticheskogo raiona severnogo polushariia po obmenu tepla mezhdu materikom i okeanom, [Determination of natural synoptic regions of the Northern Hemisphere from the heat exchange between the continents and the oceans], p. 65-69
- Yeh, Tu-Cheng and Chu, Pao-Chen: The onset of the transitional seasons in the Far East from the viewpoint of the general circulation, p. 71-87
- Pan, Jün-Fang and Kao, Yu-Hsi: On the study of the activities of the polar high by using advective-dynamic theory, p. 98-108
- Yang, C. C. and Yao, C. R.: On the diurnal variation of atmospheric pressure in China, p. 109-124
- Cheng, Chwen-Shu: On the occurrences of coldspells in the Lower Yantze, p. 125-134
- Shu, En Khan: Kazhushchaiaisia spliusnutost' nebesnogo svoda i izmenenie kazhushcheisia velichiny diska solntsa i luny, [Apparent flattening of the firmament and change in the apparent size of the disk of the sun and moon], p. 144-148

Air Pollution Control Association, 49th Annual Meeting, May 20-24, 1956, Buffalo, New York, Proceedings (each section repaged)

- Yocom, J. E.; Hein, G. M. and Nelson, H. W.: A study of the effluents from back-yard incinerators. Section 2 (21 p.)
- Kleinsasser, T. W. and Wanta, R. C.: The development of a forecasting service for use in air pollution control. Section 7 (16 p.)
- Christy, William G.: Area air pollution surveys. Section 12 (10 p.)
- Rossano, August T., Jr.: The joint city, county, state, and federal study of air pollution in Louisville, Kentucky. Section 19 (9 p.)
- Holmes, R. G.; Kauper, E. K.; Street, A. B. and Taylor, J. R.: Air flow studies of heavy smog in Los Angeles. Section 20 (10 p.)
- Renzetti, N. A. and Romanovsky, J. C.: A comparative study of oxidants and ozone in Los Angeles atmosphere. Section 21 (28 p.)
- Romanovsky, J. Cyril; Taylor, James R.; MacPhee, R. D. and Dickinson, Janet R.: Air monitoring of the Los Angeles atmosphere with automatic instruments. Section 22 (23 p.)
- Moore, G. E.; Cole, A. F. W. and Katz, Morris: The concurrent determination of sulfur dioxide and nitrogen dioxide in the atmosphere. Section 24 (17 p.)

Akademiia Nauk SSSR, Izvestiia, Ser. Geofizich., No. 1, 1957

- Koridalin, E. A.: Seismologiya v Kitaiskoj Narodnoj Respublike, [Seismology in the Chinese Peoples' Republic], p. 3-9
- Rustanovich, D. H.: Nekotorye voprosy izucheniia seismichnosti Ashkhabadskogo raiona, [Some problems in the study of seismicity of the Ashkhabad region], p. 10-20
- Andreev, S. S.: Izuchenie glubinnogo stroeniia zemnoi kory pri pomoshchi obmennyykh voln PS, registriruemyykh pri zemletriaseniiaakh, [Study of the structure of the deep layers of the earth's core by means of PS recording during earthquakes], p. 21-29
- Kazinskiĭ, V. A.: Ob uchete vliianiia topograficheskikh mass na podzemnye gravitatsionnye izmereniia, [Calculation of the influence of topographical mass on underground gravitational measurements], p. 30-38
- Ivanov, A. G.: Chastotnye issledovaniia pri detal'noi elektricheskoi razvedke, [Frequency investigations for detailed electrical prospecting], p. 39-51
- Petrova, G. N.: Magnitnaia stabil'nost' gornyykh porod, [Magnetic stability of rock strata], p. 52-61
- Enenshtein, B. S. and Aronov, L. E.: Eksperimental'nye issledovaniia estestvennogo elektromagnitnogo polia zemli v spektre chastot ot 2 do 300 μ , [Experimental investigations on the natural electromagnetic field of the earth in the spectral frequencies from 2-300 μ], p. 62-70
- Velikanov, M. A.: Krupnomasshtabnaia turbulentnost' i struktura ruslovogo protsessa, [Large-scale turbulence and the structure of channel processes], p. 71-78
- Gutman, L. N.: Teoreticheskaiia model' smercha, [Theoretical model of a tornado], p. 79-93

- Vulfson, N. I.: *Kompensatsionnye niskhodiashchie techeniia obuslovlennye razvivaiushchimisia kucheivymi oblakami*, [Downward compensation currents produced by developing cumulus clouds], p. 94-103
- Mikirov, A. E.: *Fotoelektricheskii metod issledovaniia raspredeleniia razmerov chastits osadkov*, [Photoelectric method of investigating the size distribution of precipitation particles], p. 104-108
- Bulashevich, Iu. P. and Voskovoïnikov, G. M.: *Gamma-gamma-karottazh na ugol'nykh mestorozhdeniakh Urala i vozmoshnost' beskerenovogo burniia chasti razvedochnykh skvazhin*, [Gamma-gamma-core sampling in the coal deposits of the Urals and the possibility of sampling without cores], p. 109-112
- Kharin, D. A. and Rulev, B. G.: *Elektrodinamicheskii seismograf dlia zapisi bol'shikh peregreshchenii*, [Electrodynamic seismograph for records of large disturbances], p. 113-115
- D'iakonov, B. P.: *Tsilindr v pole tochechnogo istochnika elektricheskogo toka*, [Cylinder in the field of a point source electric current], p. 116-121
- Okhotsimskaia, M. V.: *O vliianii meteornogo potoka Perseid na elektricheskoe pole atmosfery zemli*, [Influence of the Perseid meteor shower on the electric field of the earth's atmosphere], p. 122-123
- Petukhov, V. A.: *Ob opredelenii skorostei korpuskul, vybrasyvaemykh iz aktivnykh oblastei solntsa, po vremeni zapazdyvaniia iavlenii na zemle*, [Determination of the velocity of corpuscles released from the active regions of the sun from the time lag of the phenomena on the earth], p. 124
- Kondorskaia, N. V.: *Sessia soвета po seismologii*, [Soviet seminar on seismology], p. 125-127

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